KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
Opp : Yerragattu Gutta, Hasanparthy (Mandal), WARANGAL - 506 015, Telangana, INDIA.
काकतीय प्रैद्योगिकी एवं विज्ञान संस्थान, वरंगल - ५०६ ०१५ तेलंगाना, भारत
కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
(An Autonomous Institute under Kakatiya University, Warangal)
(Approved by AICTE, New Delhi; Recognised by UGC under 2(f) & 12(B); Sponsored by EKASILA EDUCATION SOCIETY)
DEPARTMENT OF INFORMATION TECHNOLOGY

B.TECH. CURRICULUM

ACADEMIC YEAR : 2024–25

DEPARTMENT OF INFORMATION TECHNOLOGY

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
Competancy-Focused Outcome Based Curriculum (CF-OBC)

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

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DEPARTMENT OF INFORMATION TECHNOLOGY

History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG in B.Tech. Information Technology	• Started with 40 seats in 1999-2000 • Intake increased to 60 in 2001-2002 • Intake increased to 120 in 2020-2021	• First time Tire-II accreditation: 2016-2019 • Tire-I accreditation: 2019-2022 • Tire –I Reaccreditation: 2022-2025

INSTITUTE VISION AND MISSION

INSTITUTE VISION

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

INSTITUTE MISSION

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

DEPARTMENT OF INFORMATION TECHNOLOGY : VISION AND MISSION

VISION

To become a Center of Excellence in the Information Technology discipline with effective teaching and strong research environment that makes our students globally competitive with strong ethical values and leadership abilities.

MISSION

M1:	To impart technical knowledge to the students to turn out proficient and well groomed engineers.
M2:	Motivate students to improve skills by attending training programs and internships that leads to develop innovative projects in emerging technologies.
M3:	To train our students for higher education, leadership in profession and adopt quality research.

PROGRAM EDUCATIONAL OBJECTIVES

Within first few years after graduation , the information technology graduates will be able to…

PEO1:	**Technical Competence** analyze, formulate and solve engineering problems by using sound theory and practices knowledge of Information Technology
PEO2:	**Successful Career** develop Information Technology solutions with the changing needs of the society for the career-related activities
PEO3:	**Soft Skills and Life-longLearning** utilize the knowledge of Information Technology to pursue higher education and research

PEOS TO MISSION MAPPING

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

PEO Statements	Mission Statements	Mapping Level	Justification
PEO1	**M1**	**3**	The curriculum is well designed to impart in-depth knowledge in theory and lab courses for the students to excel in the Information Technology discipline.
	M2	**2**	Students are encouraged to attend training programmes organized by the Institute and to carry out internships in various organizations. Department conducts various technical events like seminars, workshops on latest technologies for the students periodically.
	M3	**2**	Guidance is provided to the students to appear for entrance examinations to pursue their higher studies. Faculty advises the students to do projects relevant to research and societal needs by referring papers published in high quality journals like, IEEE, ACM, Elsevier, Springer etc.

PEO2	**M1**	**3**	Choice based curriculum is introduced to the students to concentrate more on practical and elective courses which prepare them in developing optimized algorithms and efficient application software.
	M2	**3**	Attending training and internship programmes, students acquire the knowledge in developing real world applications.
	M3	**2**	Department organizes seminars to the students to acquire knowledge on current technologies which help them to develop innovative research projects. Students are also encouraged to publish papers in reputed journals and conferences.
PEO3	**M1**	**2**	Curriculum is revised periodically which makes the students to get the knowledge about emerging technologies required by the industry.
	M2	**3**	Participation in various technical events like paper presentations, coding contest and attending guest lectures delivered by eminent persons from industry, students acquire the knowledge about the changing needs of society which drives them to implement innovative projects. Faculty enrich their knowledge by attending faculty development programmes on current technologies and impart the knowledge to the students.
	M3	**3**	Faculty discuss the concepts and current research areas in relevant subjects during teaching learning process. It helps the students to decide the area for their higher studies and develop projects based on research and societal needs.

PROGRAM SPECIFIC OBJECTIVES

Within first few years after graduation, the INFORMATION TECHNOLOGY graduates will be able to

PSO1:	apply analytical and experimental problem-solving skills in the Information Technology discipline
PSO2:	make use of programme specific knowledge to investigate new and emerging technologies leading to innovations and to begin immediate professional practice in the field of Information Technology

PO/PSO TO PEO MAPPING

PO's		PEO1	PEO2	PEO3
PO1	Engineering Knowledge	3	2	2
PO2	Problem Analysis	3	2	2
PO3	Design/Development of solutions	3	2	3
PO4	Conduct investigations of complex problems	2	2	2
PO5	Engineering Tool Usage	2	2	2
PO6	The Engineer and The World	1	2	3
PO7	Ethics	2	2	2
PO8	Individual and Collaborative Team work	2	2	2
PO9	Communication	2	2	2
PO10	Project management and finance	1	2	3
PO11	Lifelong Learning	3	2	2
PSO's				
PSO1	Apply analytical and experimental problem-solving skills in the Information Technology discipline	3	2	2
PSO2	Make use of programme specific knowledge to investigate new and emerging technologies leading to innovations and begin immediate professional practice in the field of Information Technology	3	3	2

DESIGN OF CURRICULUM

Salient Features

- The URR24 regulations are inline with the National Education Policy 2020 (NEP2020) and the AICTE model curriculum to provide multidisciplinary holistic education to produce well-rounded engineering graduates.
- Mulitple Entry Multiple Exit (MEME) option.
- Multidisciplinary four year UG progrmme with award of following degrees
    - B. Tech
    - B. Tech with "Minor"
    - B. Tech "Honours"
    - B. Tech "Honours with Research"
- 170+ Credit Liberal Engineering Education.
- A strong program core of 18 courses and 5 baskets of program electives to ensure the breadth and depth in a chosen domain of studies. Program electives are arranged either to grow in a specified vertical or have diversified exposure.
- Full semester industry internship to the interested students.
- Aggressive model of "Learning-by-doing" in the form of PRACTICUM.
- Activity Based Learning (ABL) about Life, Literature and Culture is embedded in to the curriculum in four semesters, ensuring all dimensional holistic growth of the learner. These four activity based mini courses are offered as two sequels namely Social Empowerment Activities (SEA) and Self Accomplishment Activities (SAA).
- These regulations follow holistic approach of education, ensure strong science, mathematics foundation and program core, develop expertise in domain vertical though sequel of electives, ensure significant exposure of additional discipline through "Minor" programme, challenge good learners through "Honours" programme and the research oriented students through "Honours with Research" programme.
- Along with Major and Minor disciplinary courses, students are expected to learn Multidisciplinary Open Elective Courses (MOPEC), Skill Enhancement Courses (SEC), Ability Enhancement Courses (AEC), Value Added Courses (VAC), Activity Based Learning (AL) and Experiancial 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, offer a unique "T-Shaped" liberal "Pi-Model" of Engineering Education

The Curriculum consists of the following components of study:

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

Multidisciplinary Open Electives Courses (MOPEC)

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

Practicum

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

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

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

1. *Data collection*
2. *Data PreProcessing*
3. *Application of Supervised Learning algorithms*
4. *Application of Un-Supervised Learning algorithms*
5. *Visualization*
6. *Analysis of Performance metrics*

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

Program Electives Courses (PEC)
The curriculum offeres five 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 accorss the verticals.

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

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

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

The NEP-2020 quotes, "*Higher education must develop good, well-rounded and creative individuals, with intellectual curiosity, spirit of service and a strong ethical compass*". Moving towards a more liberal undergraduate education is one of the most important feature of the NEP2020 . "*The needs of the 21stcentury require, that liberal broad-based multidisciplinary education become the basis for all higher education. This will help develop well-rounded individuals that possess critical 21stcentury capacities in fields across arts, humanities, sciences, social sciences, and professional, technical, and vocational crafts, an ethic of social engagement, and rigorous specialization in a chosen field or fields. The approach across all undergraduate programs, including those in professional, technical, and vocational disciplines would be leading to holistic education, in the long run.*

Imaginative and flexible curricular structures will enable creative combinations of disciplines for students to study, thus demolishing currently prevalent rigid boundaries and creating new possibilities for lifelong learning. The notion of 'knowledge of many arts'- i.e. what is called 'liberal arts' in modern times – must be brought back to Indian education, as it is exactly the kind of education that will be required for the 21stcentury."

To ensure holistic development of the learner, an attempt has been made in this curriculum to blend engineering education appropriately with arts, humanities, crafts, ethics of personal and social engagement. Activity based liberal learning courses covering life, literature, and culture are added. Every learner is expected to take one such course in first four semesters. We strongly believe that these four liberal learning modules will expose the learners to holistic education as envisaged in NEP2020.

(END OF THE SALIENT FEATURES OF URR24)

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

1. **Title:**

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

2. **Scope:**

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

3. **Duration of Programmes:**

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

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

4. **Credit Requirements:**

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

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

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

5. Commencement:

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

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

6. Eligibility Criteria:

(i) **Level 4.5:** The students who have successfully completed Grade 12 / Intermediate with MPC or its equivalent course shall be eligible for admission to the first year degree programme

(ii) **Level 5** : The students who have successfully completed Level 4.5 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal

(iii) **Level 5.5** : The students who have successfully completed Level 5 of the undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal

(iv) **Level 6** : The students who have successfully completed Level 5.5 (bachelor degree of three years or six semesters) of undergraduate programme at this Institute or any other HEIs registered on Academic Bank of Credits Portal

7. Academic Bank of Credits (ABC):

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

7.1 Operationalization of ABC:

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

The ABC related operations shall be as follows:

(i) The MEME option for student is facilitated at the undergraduate and postgraduate levels.

(ii) It would facilitate credit accumulation through the facility created by the ABC scheme in the "Academic Bank Account" opened for students across the country to transfer and consolidate the credits earned by them by undergoing courses in any of the eligible HEIs. The eligibility of HEIs to offer courses shall be as per UGC (Establishment and Operationalization of ABC scheme in Higher Education) Regulations 2021 dated 28.7.2021 and changes therein notified by the UGC from time to time.

(iii) The ABC allows credit redemption through the process of commuting the accrued credits in the Academic Bank Account maintained in the ABC for the purpose of fulfilling the credits requirements for the award of certificate/ diploma/ PG diploma/ degree by the authorized HEIs

(iv) Upon collecting a certificate, diploma, PG diploma or degree, all the credits earned till then, in respect of that certificate, diploma, PG diploma or degree shall stand debited and redeemed from the account concerned.

(v) HEIs offering programmes with the MEME system need to register in the ABC to enable acceptance of multidisciplinary courses, credit transfer, and credit acceptance.

(vi) The validity of credits earned will be for a maximum period of seven years or as prescribed by the UGC

(vii) The procedure for depositing credits earned, its shelf life, redemption of credits, would be as per UGC (Establishment and Operationalization of ABC scheme in Higher Education) Regulations 2021 dated 28.7.2021 and changes therein notified by the UGC from time to time

7.2 Monitoring, Support and Quality by Universities and ABC:

(i) It shall be the responsibility of Registered HEIs, to monitor the development and operationalization of the ABC programme at the university level and at the level of their affiliated colleges

(ii) Registered HEIs shall offer teachers training, staff training, mentoring, academic and administrative audit and other measures for improving the quality of performance of the ABC facility and promotion of holistic and multidisciplinary education with the support of ABC

(iii) The quality assurance of the implementation of ABC at the level of the registered university shall be looked by the Director, Examinations and Evaluation of the Institute of the officer nominated by him different from ABC nodal officer, under the directives and guidance of Controller of Examinations of the Institute

(iv) The Institute shall upload, annually, on its website, a report of its activities related to the Academic Bank of Credits, as well as of measures taken by it for Quality Assurance, Quality Sustenance and Quality Enhancements

(v) The Grievance Redressal Committee constituted by the examination section shall be responsible for addressing the Grievance and appeals related to ABC

8. Building Competencies through Padegogy:

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 padagogocal approches:

(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 classroom time as a privilege

(xi) The UGC regulations, 2021 on Credit Framework for Online Learning Courses through SWAYAM, facilitates an institution to allow up to 40 percent of the total courses being offered in a particular programme in a semester through massive open online courses (MOOCs) offered by the SWAYAM / NPTEL and other e-learning platforms. Students shall be encouraged to complete equivalent courses through SWAYAM / NPTEL and other e-learning platforms, approved by the BoS chair and Dean AA, towards obtaining required credits where ever necessary.

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

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

(i) SWAYAM
(ii) IIM-B
(iii) University LMS
(iv) CEC
(v) NPTEL
(vi) IGNOU
(vii) Infosys Spring Board
(viii) Future Skills Prime (Digital skilling ecosystem developed by Govt. Of India and NASSCOM)
(ix) Wadhavani Foundation
(x) Tata Strive
(xi) Any other platform approved by the BoS chair and Dean AA

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

10. CONFORMANCE TO NEP2020

MULTIPLE EXIT OPTIONS

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

10.2 MULTIPLE ENTRY OPTIONS

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

(i) **No. of maximum exits:** As per NEP2020/UGC/AICTE guidelines on MEME

(ii) **No. of maximum entry:** As per NEP2020/UGC/AICTE guidelines on MEME

(iii) **Maximum gap between exit and entry:** As per NEP2020/UGC/AICTE guidelines on MEME

(iv) **Academic Bank of Credits shall be maintained**

11. Options for Degree Certificate

(i). Learners who earn a minimum of total 172 credits will be **awarded** ***"B.Tech" degree which confirms to NEP2020 requirements of multidisciplinary holistic education.***

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

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

Students opting for Minor degree offered by other departments / in identified cutting-edge technologies /external recognized organizations, can start the programme in either 3rd semester or in 5th semester as per their interest. The requirement for completion of Minor degree programme is that the students are,

(i) **3rd to 6th semeseters**: allowed to take maximum one theory and one lab course in each semester, starting from 3rd to 6th semesters

(ii) **7th & 8th semesters**: allowed to take only one theory course per semester in 7th and 8th semesters

Students should complete 4 theory and two lab courses by the end of 8th semester. However, All four theory courses have to be completed through MOOCS and lab courses have to be completed in the department which offers the Minor degree programme.

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

Students opting for Honours degree offred by their own department / external recognized organizations, can start in eith 3rd or 5th semester aas per their interest. The requirement for completion of Minor degree programme is that the students are,

(i) **3rd to 6th semeseters**: allowed to take maximum one theory and one lab course in each semester, starting from 3rd to 6th semesters

(ii) **7th & 8th semesters**: allowed to take only one theory course per semester in 7th and 8th semesters

Students should complete 4 theory and two lab courses by the end of 8th semester. However, All four theory courses have to be completed through MOOCS and lab courses have to be completed in the department which offers the Minor degree programme.

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

Students opting for Honours with Research degree, can start in 4th semester. They are expected to complete one course on "Research Methodology" through MOOCS or can complete one week FDP on "Research Methodology" during 4th semester (4 credits).

They have to complete two research internships each of 2-month duration, one in summer after 2nd year (5 credits) and other in summer after 3rd year (5 credits). They have to work on **individual research based project**, starting from 5th semester onwards. They have to present a Seminar on the individual research project in 5th semester, carryout a Mini-Project during 6th semester and continue the same as Major Project during 7th & 8th semesters. Finally, publish a research paper as outcome of their research project, in a journal indexed by SCI/SCOPUS/WEB OF SCIENCE (4 credits), by the end of 8th semesetr. ***(The individual research project itself shall be considered for regular B. Tech degree programme under Seminar, Mini-Project and Major Project work courses)***

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

Semester	B. Tech with "Minor"	B. Tech with "Honours"	B. Tech "Honours with Research"
I	-	-	-
II	-	-	-
III	1 theory (4 credits) + 1 lab (1 credit)	1 theory (4 credits) + 1 lab (1 credit)	-
IV	1 theory (4 credits) + 1 lab (1 credit)	1 theory (4 credits) + 1 lab (1 credit)	"Research Methodology" Theory Course (4 Credits)
Summer break after 2nd 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 3rd year	-	-	2-Months Research Internship -II (5 credits)
VII	1 theory (4 credits)	1 theory (4 credits)	
VIII	1 theory (4 credits)	1 theory (4 credits)	One research publication in Journal indexed by SCI / SCOPUS / Web of Science (4 Credits)
Total additional credits to be earned	**Overall 18 credits (through 4 theory and 2 lab courses)**	**Overall 18 credits (through 4 theory and 2 lab courses)**	**18 credits (through Research Methodology, 2 Research Internships and a Research Publication out of Individual Research Project)**

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

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

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

11.3 Options for earning of "Additional Points" for Honours certification

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

Note: As the activities mentioned in the above Table of 11.3 are aimed at an additional professional dimention 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 and Social Sciences including Management Courses (HSMC)

Sl. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	HSM 01	U24MH105	English Communication and Report Writing	I	2
2.	HSM 02	U24MH508	Technical English	V	1
3.	HSM 03	U24MB605	Management Course Basket	V	3
				Total:	6

(ii) Basic Science Courses (BSC)

Sl. No.	Course Type	Curse Code	Course Name	Semester	Credits
1	BSC 01	U24MH101	Differential Calculus and Ordinary Differential Equations	I	3
2	BSC 02	U24CY102B	Engineering Chemistry	I	4
3	BSC 03	U24MH201	Matrix Theory and Vector Calculus	II	3
4	BSC 04	U24PY202B	Engineering Physics	II	4
5	BSC 05	U24MH401D	Discrete Mathematics and Probability, Statistics	IV	3
				Total:	17

(iii) Engineering Science Courses (ESC)

Sl. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	ESC 01	U24IT103	Digital Logic Design	I	3
2.	ESC 02	U24ME107	Engineering Graphics through CAD	I	1
3	ESC 03	U24EE205B	Basic Electrical Engineering	II	4
4	ESC 04	U24IT301	Artificial Intelligence	III	3
5	ESC 05	U24IT504	Introduction to Internet of Things	V	4
6	ESC 06	U24IT602	Data Science	VI	3
				Total:	18

(iv) Program Core Courses (PCC)

Sl. No.	Course Type	Course Code	Course Name	Semester	Credits
1	PCC 01	U24IT104	Programming for Problem Solving with C	I	4
2	PCC 02	U24IT203	Computer Architecture and Organization	II	3
3	PCC 03	U24IT204	Data Structures through C	II	4
4	PCC 04	U24IT302	Advanced Data Structures	III	4
5	PCC 05	U24IT303	Software Engineering	III	3
6	PCC 06	U24IT304	Database Management System	III	4
7	PCC 07	U24IT305	Object Oriented Programming through Java	III	4
8	PCC 08	U24IT402	Design and Analysis of Algorithms	IV	4
9	PCC 09	U24IT403	Python Programming	IV	4
10	PCC 10	U24IT404	Operating Systems	IV	4
11	PCC 11	U24IT405	Computer Networks	IV	3
12	PCC 12	U24IT502	Machine Learning	V	4
13	PCC 13	U24IT503	Information Security	V	3
14	PCC 14	U24IT603	Cloud Computing	VI	4
15	PCC 15	U24IT604	Full Stack Development using JAVA	VI	4
16	PCC 16	U24IT703	DevOps Essentials	VII	4
17	PCC 17	U24IT704	Big Data Analytics	VII	3
18	PCC 18	U24IT705	Software Testing and Quality Assurance	VII	3
				Total:	66

(v) Program Elective Courses (PEC)

SL. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	PEC 01	U24IT601A	Block Chain Technologies	VI	3
		U24IT601B	Generative Artificial Intelligence		
		U24IT601C	Advanced Computer Networks		
		U24IT601D	Parallel Programming		
		U24IT601E	Applications of IoT		
2.	PEC 02	U24IT702A	Distributed Computing and Cloud Security	VII	3
		U24IT702B	Computer Vision & Image Processing		
		U24IT702C	Mobile Computing		
		U24IT702D	High Performance Computing Architecture		
		U24IT702E	Industrial IoT		
3.	PEC 03	U24IT802A	Ethical Hacking	VIII	3
		U24IT802B	Natural Language Processing		
		U24IT802C	Adhoc Sensor Networks		
		U24IT802D	Fog & Edge Computing		
		U24IT802E	Privacy and Security in IoT		
4.	PEC 04	U24IT803A	Computer Forensics	VIII	3
		U24IT803B	Deep Learning		
		U24IT803C	Wireless Networks		
		U24IT803D	Augmented Reality &Virtual Reality		
		U24IT803E	IoT Architectures and Protocols		
				Total:	12

(vi) Experiantial Learning Courses (ELC)

Sr. No.	Course Type	Curse 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	U24IT509	Seminar	V	1
6.	ELC06	U24IT608	Mini Project	VI	1
7.	ELC07	U24IT706	Internship Evaluation	VII	1
8.	ELC08	U24IT707	Major Project Phase-I / Industrial Internship - I	VII	4
9.	ELC09	U24IT804	Major Project Phase-II / Industrial Internship - II	VIII	6
				Total:	17

(vii) Indian Knowledge System Course (IKSC)

Sr. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	IKSC 01	U24IK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)	Student Induction Programme	0
2.	IKSC 02	U24IK506A	Essence of Indian Traditional Knowledge	V	2
3.	IKSC 03	U24IK606B	Universal Human Values -II	VI	2
				Total:	4

(viii) Multidisciplinary Open Electives Courses (MOPEC)

Sr. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	MOPEC 01	U24OEX01ITX	MOPEC Elective –I	V	3
2.	MOPEC 02	U24OEX01ITX	MOPEC Elective –II	VII	3
3.	MOPEC 03	U24OEX01ITX	MOPEC Elective –III	VIII	3
				Total:	9

(ix) Value Added Courses (VAC)

SL. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	VAC 01	U24VA106	Sports & Yoga	I	1
2.	VAC 02	U24VA109XXXXX	SEA – I / SAA-I	I	1
3.	VAC 03	U24CY206	Environmental Studies	II	-
4.	VAC 04	U24VA210 XXXXX	SEA-2 / SAA -2	II	1
5.	VAC 05	U24VA306B	Soft & Interpersonal Skills	III	1
6.	VAC 06	U24VA309 XXXXX	SEA-3 / SAA -3	III	1
7.	VAC 07	U24VA406A	Quantitative Aptitude and Logical Reasoning	IV	2
8.	VAC 08	U24VA409 XXXXX	SEA - 4 / SAA – 4	IV	1
				Total:	8

(x) Skill Enhancement Courses (SEC)

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

(xi) Ability Enhancement Courses (AEC)

Sl. No.	Course Type	Course Code	Course Name	Semester	Credits
1	AEC 01	U24AE110	Expert Talk Series-1	I	1
2	AEC 02	U24AE207	Idea Lab Makerspace	II	1
3	AEC 03	U24AE211	Expert Talk Series-2	II	1
4	AEC 04	U24AE310	Expert Talk Series-3	III	1
5	AEC 05	U24AE410	Expert Talk Series-4	IV	1
6	AEC 06	U24AE510	Expert Talk Series-5	V	1
7	AEC 07	U24AE609	Expert Talk Series-6	VI	1
				Total:	7

(xii) Startups and Entrepreneurship Courses (STE)

Sr. No.	Course Type	Curse Code	Course Name	Semester	Credits
1.	STE	U24ST505	S&E Basket	V	3

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

Activity Based Learning (ABL) @ Value Added Courses

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

Social Empowerment Activities - SEA

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

- These are categorized under four groups namely
  1. **Swacch Bharat** (Clean India)
     The aim of activities under Swachh Bharat is to promote cleanliness, hygiene and sanitation across India.
  2. **Shikshit Bharat** (Educated India)
     The aim of activities under Shikshit Bharat is to ensure inclusive and equitable quality education for all, promoting lifelong learning opportunities.
  3. **Samruddha Bharat** (Prosperous India)
     The aim of activities under Samrudha Bharat is to promote economic growth, self-reliance, and prosperity for all citizens.
  4. **Surakshit Bharat** (Safe India)
     The aim of activities under Surakshit Bharat is to ensure the safety, security, and well-being of all citizens.

Self-Accomplishment Activities - SAA

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

        The aim of activities under Socho Bharat is to foster critical thinking, innovation, and intellectual development among citizens.
    2. **Sanskarit Bharat** (Cultured India)

        The aim of activities under Sanskarit Bharat is to preserve, promote, and celebrate India's rich cultural heritage, traditional values, and ethical practices by nurturing morals, fostering social harmony and creating awareness and appreciation of Inda's rich history.
    3. **Saksham Bharat** (Empowered India)

        The aim of activities under Saksham Bharat is to empower individuals and communities with the skills, resources, and opportunities needed to achieve self-reliance and economic independence by fostering physical fitness, discipline, teamwork leadership and mental resilience.
    4. **Sunder Bharat** (Beautiful India)

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

Table: SEA

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

		SE104	Healthy habits-happy schools/Medical camps in schools /peer health
		SE105	Lifesaving skills /school clinics /First Aid training for a week
		SE106	Sustainable living /Surveys and Estimation for roof tops
		SE110	Any other activity approved by Dean Academic Affairs
SEA Group-2: Shikshit Bharat	**Humanity Club**	**SE201**	Peer mentoring /Mentoring of School Children
		SE202	Rural digital revolution / Digital Literacy for yielders & Participation in "Teach-for-India" movement
		SE203	Empowering learners –schools /Value addition for deprived schools
		SE204	Peer Mentoring /Mentoring junior (first year) students at KITSW
		SE205	Learning by Teaching /Teaching Assistantship at KITSW/Teaching AIDE
		SE206	Enriching Education/Development of learning material for schools/ITIs
		SE210	Any other activity approved by Dean Academic Affairs
SEA Group-3: Samruddha Bharat	**C-i2RE**	**SE301**	Great Grass Root Innovations
		SE302	Innovation and Creativity/ Critical Thinking and Problem solving
		SE303	Team work and collaboration
		SE304	Leadership & Entrepreneurship
		SE305	Design Thinking
		SE306	Work with START-UP at KITSW
		SE310	Any other activity approved by Dean Academic Affairs
SEA Group-4: Surakshit Bharat	**NCC**	**SE401**	NCC participation/National Integrity
		SE402	Basics of fire safety/Community safety
		SE403	Disaster Management
		SE404	Environmental health & sustainability
		SE405	Road safety
		SE406	Pollution control
		SE410	Any other activity approved by Dean Academic Affairs

Code of each activity shall be: **U24VAYYY + activity code of SEA/SAA**
Example: **U24VAYYYSE101** *(for the activity Clean India—Green India (River / Beach / Mohalla / School / Campus / Govt. offices Cleaning) under SEA Group1 Swacch Bharath)*

Table: SAA

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

	Technical club	**SA304**	Participation in National Tech Fest, AICTE-Hackathon, industry floated global and National competitions, Robocon, BAHA etc
		SA305	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 /Western Dance). *Only for beginners*
		SA403	Music composition / Learning musical instrument (Any type). *Only for beginners.*
		SA404	Film Appreciation/Dramatics/Seeing through Painting
		SA405	Making short film/Photography
		SA406	Sculptures (focusing on themes of unity, peace and environmental conservation)
		SA410	Any other activity approved by Dean Academic Affairs

Code of each activity shall be: **U24VAYYY + activity code of SEA/SAA**
Example: **U24VAYYYSA101*(for the activity Study of Green & White Revolutions in India under SAA Group1 Socho Bharat)***

13. SUMMARY OF CURRICULUM COMPONENTS

S.NO.	CATEGORY	COURSECOMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (%OF CREDITS)
1	HSMC	Humanity and Social Sciences including Management Courses	3	6	3.49
2	BSC	Basic Science Courses	5	17	9.88
3	ESC	Engineering Science Courses	6	18	10.46
4	PCC	Program Core Courses	18	66	38.37
5	PEC	Program Elective Courses	4	12	6.98
6	MOPEC	Multidisciplinary Open Elective Courses	3	9	5.23
7	ELC	Experiantial Learning Courses	9	17	9.88
9	IKSC	Indian Knowledge System Courses	3	4	2.33
10	VAC	Value Added Courses	8	8	4.65
11	SEC	Skill Enhancement Courses	5	5	2.91
12	AEC	Ability Enhancement Courses	7	7	4.07
13	STE	Startups and Entrepreneurship Courses	1	3	1.74
Total			**72**	**172**	**100**

14. SEMESTER WISE COURSE / CREDIT DISTRIBUTION

Semester	Number of Courses / Number of Credits (*Course Category wise*)												
	BSC	**ESC**	**HSMC**	**PCC**	MOPEC	**PEC**	**SEC**	**VAC**	**ELC**	**AEC**	**IKSC**	**STE**	**TOTAL**
I	2/7	2/4	1/2	1/4				2/2	1/1	1/1	1/0		11/21
II	2/7	1/4		2/7			1/1	2/1	1/1	2/2			11/23
III		1/3		4/15			1/1	2/2	1/1	1/1			10/23
IV	1/3			4/15			1/1	2/3	1/1	1/1			10/24
V		1/4	2/4	2/7	1/3		1/1		1/1	1/1	1/2		10/23
VI		1/3		2/8		1/3	1/1		1/1	1/1	1/2	1/3	9/22
VII				3/10	1/3	1/3			2/5				7/21
VIII					1/3	2/6			1/6				4/15
Total	**5/17**	**6/18**	**3/6**	**18/66**	**3/9**	**4/12**	**5/5**	**8/8**	**9*/17**	**7/7**	**3/4**	**1/3**	**72/172**
% Weightage of Course Category	9.88% (17/172)	10.46% (18/172)	3.48 % (6/172)	38.37% (66/172)	5.23% (9/172)	6.97 % (12/172)	2.90 % (5/172)	4.65% (8/172)	9.88% (17/172)	4.06% (7/172)	2.32% (4/172)	1.74% (3/172)	100 % (172/172)

* Seminar - 1C, Mini Project - 1C, Internship Evalution-1C, Major Project : 4+6=10C

Scheme of Instruction

B. Tech (IT) –CURRICULUM (KITSW-URR24)

SEMESTER-WISE CURRICULUM WITH SCHEME OF INSTRUCTION

Abbreviations

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

I SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
-	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 *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
3	ESC	U24IT103	Digital Logic Design	2	1	-	4	7	3
4	PCC	U24IT104	Programming for Problem Solving with C	2	1	2	5	10	4
5	HSM	U24MH105	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA106	Sports & Yoga	-	-	2	2	4	1
7	ESC	U24ME107	Engineering Graphics through CAD	-	-	2	2	4	1
8	ELC	U24EL108	Practicum - 1	-	-	-	4	4	1
9	VAC	U24VA109 XXXXX	SEA – I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
			Total:	10	4	8	34	56	21
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

Pool – III (Chemistry)		
S. No.	Course Code	Course Title
1.	U24CY102A	Engineering Chemistry *(for Mechanical Engineering)*
2.	U24CY102B	Engineering Chemistry *(Common to CSM, CSD, CSN, CSO & IT)*

II SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH201	Matrix Theory and Vector Calculus	2	1	-	6	9	3
2	BSC	U24PY202B	Engineering Physics *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
3	PCC	U24IT203	Computer Architecture and Organization	2	1	-	4	7	3
4	PCC	U24IT204	Data Structures through C	2	1	2	5	10	4
5	ESC	U24EE205B	Basic Electrical Engineering *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
6	VAC	U24CY206	Environmental Studies	2	-	-	2	4	-
7	AEC	U24AE207	Idea Lab Makerspace	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210 XXXXX	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				12	5	10	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)		
S. 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)		
S. 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)*

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 IT)

(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 IT: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT212X	PC Software	2	-	2	-	4	3
2	PCC	U24IT213X	Digital Marketing	2	-	2	-	4	3
3	PCC	U24IT214X	Web Designing	2	-	2	-	4	3
4	PCC	U24IT215X	Hardware and Networking	2	-	2	-	4	3
5	PCC	U24IT216X	Any other course approved by BoS Chair and Dean AA						

(OR)

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

Exit Option to Qualify UG Certificate in IT: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212X	UNIX/LINUX Programming https://www.udemy.com/course/complete-linux-training-course-to-get-your-dream-it-job/?couponCode=ST3MT72524	-	-	6	-	6	3
2	SEC	U24SE213X	Java Programming https://learn.oracle.com/ols/learning-path/java-fundamentals/55593/55578	-	-	6	-	6	3
3	SEC	U24SE214X	Advanced Data Structures https://www.udemy.com/course/data-structures-and-algorithms-deep-dive-using-java/?couponCode=ST3MT72524	-	-	6	-	6	3
4	SEC	U24SE215X	SQL and PL/SQL Programming https://www.udemy.com/course/the-ultimate-mysql-bootcamp-go-from-sql-beginner-to-expert/?couponCode=ST3MT72524	-	-	6	-	6	3
5	SEC	U24SE216X	Any other skill based course approved by BoS Chair and Dean, AA	-	-	6	-	6	3

III SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	ESC	U24IT301	Artificial Intelligence	2	1	-	4	7	3
2	PCC	U24IT302	Advanced Data Structures	2	1	2	5	10	4
3	PCC	U24IT303	Software Engineering	2	1	-	4	7	3
4	PCC	U24IT304	Database Management Systems	2	1	2	5	10	4
5	PCC	U24IT305	Object Oriented Programming through Java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft and Interpersonal Skills Laboratory	-	-	2	2	4	1
7	SEC	U24SE307	Programming Skill Development Lab - 2	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309 XXXXX	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
			Total:	**10**	**5**	**10**	**34**	**59**	**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 grade sheet)				-	-	-	-	-	-

T&P Basket		
S. No.	Course Code	Course Title
1.	U24VA306A	Quantitative Aptitude and Logical Reasoning
2.	U24VA306B	Soft and Interpersonal Skills

IV SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH401D	Discrete Mathematics and Probability, Statistics	2	1	-	6	9	3
2	PCC	U24IT402	Design and Analysis of Algorithms	2	1	2	5	10	4
3	PCC	U24IT403	Python Programming	2	1	2	5	10	4
4	PCC	U24IT404	Operating Systems	2	1	2	5	10	4
5	PCC	U24IT405	Computer Networks	2	1	-	4	7	3
6	VAC	U24VA406A	Quantitative Aptitude and Logical Reasoning	2	-	-	2	4	2
7	SEC	U24SE407	Programming Skill Development Lab - 03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409 XXXXX	SEA - 4 / SAA - 4	-	-	-	2	2	1
10	AEC	U24AE410	Expert Talk Series-4	-	-	-	1	1	1
11	VAC*	U24CY411*	Environmental Studies*	2*	-	-	3*	5*	-
Total:				12	5	8	36	61	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)				-	-	-	-	-	-

******For Lateral Entry Students Only***

Branch Specific Mathematics (Pool-4)		
S. No.	**Course Code**	**Course Title**
1.	U24MH401A	Numerical and Statistical Methods *(for Civil Engineering)*
2.	U24MH401B	Applied Mathematics *(for Mechanical Engineering)*
3.	U24MH401C	Applied Mathematics *(Common to ECI, EEE & ECE)*
4.	U24MH401D	Discrete Mathematics and Probability Statistics *(Common to CSE, CSN, CSO & IT)*
5.	U24MH401E	Essential Mathematics and Statistics for Machine learning *(for CSM)*
6.	U24MH401F	Essential Mathematics and Statistics for Data science *(for CSD)*

T&P Basket		
S. No.	**Course Code**	**Course Title**
1.	U24VA406A	Quantitative Aptitude and Logical Reasoning
2.	U24VA406B	Soft and Interpersonal Skills

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 IT)

(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 IT: Any Two (02) Courses during the 2 - Months internship										
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT412X	Introduction to Web Programming	2	-	2	-	4	3
2	PCC	U24IT413X	Internet of Things	2	-	2	-	4	3
3	PCC	U24IT414X	Cloud Computing	2	-	2	-	4	3
4	PCC	U24IT415X	Java Full Stack Development	2	-	2	-	4	3
5	PCC	U24IT415X	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 IT: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE412X	Programming for Web Design https://onlinecourses.swayam2.ac.in/nou24_cs12/preview	-	-	6	-	6	3
2	SEC	U24SE413X	Internet of Things using Aurdino/Raspberry Pi https://onlinecourses.swayam2.ac.in/ntr24_ed44/preview	-	-	6	-	6	3
3	SEC	U24SE414X	Cloud Computing using AWS/Google Cloud https://www.coursera.org/specializations/cloud-computing	-	-	6	-	6	3
4	SEC	U24SE415X	Full Stack using JAVA / .NET https://www.coursera.org/specializations/java-fullstack	-	-	6	-	6	3
5	SEC	U24SE416X	Any other skill based course approved by BoS Chair and Dean, AA	-	-	6	-	6	3

B. Tech Honours with Research:

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

V SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE501YYX	MOPEC Elective –I#	2	1	-	3	6	3
2	PCC	U24IT502	Machine Learning	2	1	2	5	10	4
3	PCC	U24IT503	Information Security	2	1	-	4	7	3
4	ESC	U24IT504	Introduction to Internet of Things	2	1	2	5	10	4
5	HSMC	U24MB505X	Management Course Basket	2	1	-	2	5	3
6	IKSC	U24IK506B	Universal Human Values - II	2	-	-	2	4	2
7	SEC	U24SE507	Programming Skill Development Lab - 4	-	-	2	2	4	1
8	HSMC	U24MH508	Technical English	-	-	2	2	4	1
9	ELC	U24IT509	Seminar	-	-	-	2	2	1
10	AEC	U24AE510	Expert Talk Series-5	-	-	-	1	1	1
			Total:	12	5	8	28	53	23
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	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 grade sheet)				-	-	-	-	-	-

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

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

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

VI SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PEC	U24IT601X	Program Elective –I / MOOCs-I	2	1	-	4	7	3
2	ESC	U24IT602	Data Science	2	1	-	4	7	3
3	PCC	U24IT603	Cloud Computing	2	1	2	4	9	4
4	PCC	U24IT604	Full Stack Development using JAVA	2	1	2	5	10	4
5	STE	U24ST605X	Startups & Entrepreneurship Basket	2	1	-	2	5	3
6	IKSC	U24IK606A	Essense of Indian Traditional Knowledge	2	-	-	2	4	2
7	SEC	U24SE607	Programming Skill Development Lab - 5	-	-	2	2	4	1
8	ELC	U24IT608	Mini Project	-	-	2	2	4	1
9	AEC	U24AE609	Expert Talk Series-6	-	-	-	1	1	1
Total:				12	5	8	26	51	22
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	27
Summer/ Inter-semBridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

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

B. Tech Honours with Research:

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

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

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. Voc. in IT)

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

Exit Option to Qualify B. Voc in IT: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT610X	Big Data Analytics	2	-	2	-	4	3
2	PCC	U24IT611X	Software Testing	2	-	2	-	4	3
3	PCC	U24IT612X	Fundamentals of DevOps	2	-	2	-	4	3
4	PCC	U24IT613X	Cyber Security	2	-	2	-	4	3
5	PCC	U24IT614X	Any other course approved by BoS Chair andDean AA	2	-	2	-	4	3

(OR)

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

Exit Option to Qualify B. Voc. in IT: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE610X	Deep Learning using Python https://www.simplilearn.com/tutorials/deep-learning-tutorial/deep-learning-with-python	-	-	6	-	6	3
2	SEC	U24SE611X	Cyber Security Tools https://onlinecourses.swayam2.ac.in/nou19_cs08/preview	-	-	6	-	6	3
3	SEC	U24SE612X	Automated Testing Tools https://www.udemy.com/course/automated-software-testing-with-python/?couponCode=ST3MT72524	-	-	6	-	6	3
4	SEC	U24SE613X	DevOps https://www.udemy.com/course/devops-with-docker-kubernetes-and-azure-devops/?couponCode=ST3MT72524	-	-	6	-	6	3
5	SEC	U24SE614X	Any other skill based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

VII SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE701YYX	MOPEC Elective –II	2	1	-	3	6	3
2	PEC	U24IT702X	Program Elective - II/ MOOCs-II	2	1	-	4	7	3
3	PCC	U24IT703	DevOps Essentials	2	1	2	4	9	4
4	PCC	U24IT704	Big Data Analytics	2	1	-	4	7	3
5	PCC	U24IT705	Software Testing and Quality Assurance	2	1	-	4	7	3
6	ELC	U24IT706	Internship Evaluation*	-	-	2	-	2	1
7	ELC	U24IT707	Major Project, Phase-1 / Idustrial Internship - 1	-	-	8	6	12	4
Total:				10	5	12	25	52	21
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	25

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

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

B. Tech Honours with Research

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

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

VIII SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	MOPEC	U24OE801YYX	MOPEC Elective –III	2	1	-	3	6	3
2	PEC	U24IT802X	Program Elective - III / MOOCs-IV	2	1	-	4	7	3
3	PEC	U24IT803X	Program Elective - IV / MOOCs-V	2	1	-	4	7	3
4	ELC	U24IT804	Major Project Phase – 2 / Industrial Internship - 2	-	-	12	4	16	6
			Total:	6	3	12	15	36	15
			Additional Learning@: Maximum credits allowed for Honours/Minor:	-	-	-	-	-	4
			Total credits for Honours/Minor students:	-	-	-	-	-	19

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

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

B. Tech Honours with Research

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

SUMMARY

SEMESTER	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS	21	23	23	24	23	22	21	15	172

MULTIDISCIPLINARY OPEN ELECTIVE COURSES (MOPEC) BASKETS:

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

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

Course code to be followed for all MOPECcourses:

U	2	4	O	E	X	0	1	C	E	A
URR24 Curriculum			MOPEC Elective		Semester in which MOPEC opted (5/7/8)	1st Subject in that Semester		MOPECs offered by CE Dept.		Serial Order

(I) CIVIL ENGINEERING: CE-MOPEC BASKET

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

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

(II) MECHANICAL ENGINEERING: ME-MOPEC BASKET

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

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

(III) ECE: EC -MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01ECA	Analog and Digital Electronics
2	U24OEX01ECB	Digital Electronics
3	U24OEX01ECC	Signals and Systems
4	U24OEX01ECD	Computer Architecture and Organization
5	U24OEX01ECE	Embedded System Design
6	U24OEX01ECF	Microprocessor and Microcontrollers
7	U24OEX01ECG	Linear Integrated Circuits
8	U24OEX01ECH	Digital Image Processing
8	U24OEX01ECI	Principles of Communication Systems
10	U24OEX01ECJ	Digital Signal Processing and Applications
11	U24OEX01ECK	Basic VLSI Design
12	U24OEX01ECL	Radar Engineering
13	U24OEX01ECM	Optical Communications and Networks
14	U24OEX01ECN	Wireless and Mobile Communications
15	U24OEX01ECO	Satellite Communications
16	U24OEX01ECP	Wireless Sensor Networks
17	U24OEX01ECQ	Microwave Communications
18	U24OEX01ECR	Introduction to Nanotechnology
19	U24OEX01ELZ	Any other course approved by BoS Chair and Dean AA

(IV) ECI: CI-MOPEC BASKET

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

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

(V) CSE: CS-MOPEC BASKET

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

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

(VI) IT: IT-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01ITA	Computer Networks for IT
2	U24OEX01ITB	Ethical Hacking
3	U24OEX01ITC	Programming with C++
4	U24OEX01ITD	Web Design Technologies
5	U24OEX01ITE	Software Project Management
6	U24OEX01ITF	Java Full Stack Development
7	U24OEX01ITG	DevOps
8	U24OEX01ITH	.NET Programming
9	U24OEX01ITI	Software Testing and Quality Assurance
10	U24OEX01ITZ	Any other course approved by BoS Chair and Dean AA

(VII) EEE: EE-MOPEC BASKET

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

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

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

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

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

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

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

V/VII/VIII SEMESTER		
1	U24OEX01AIA	Artificial Intelligence
2	U24OEX01AIB	Machine Learning
3	U24OEX01AIC	Deep Learning
4	U24OEX01AID	Computer Vision and Image Processing
5	U24OEX01AIE	Natural Language Processing
6	U24OEX01AIF	Exploratory Data Analysis with Python
7	U24OEX01AIG	Robotic Process Automation
8	U24OEX01AIH	Prompt Engineering for Generative AI
9	U24OEX01AII	MLOps Architecture for LLMs
10	U24OEX01AIZ	Any other course approved by BoS Chair and Dean AA

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

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

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

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

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

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

(XII) MATHEMATICS: MT-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01MTA	Operations Research
2	U24OEX01MTB	Computational Number Theory
3	U24OEX01MTC	Integral Equations & Integral Transforms
4	U24OEX01MTD	Fuzzy Set Theory and Its Applications
5	U24OEX01MTE	Complex Analysis and Applications
6	U24OEX01MTF	Discrete Mathematics and Graph Theory
7	U24OEX01MTA	Partial Differential Equations and Applications
8	U24OEX01MTB	Probability Theory and Stochastic Processes
9	U24OEX01MTC	Descriptive Statistics with R software
10	U24OEX01MTD	Numerical Linear Algebra
11	U24OEX01MTE	Applied Linear Algebra in AI and ML

12	U24OEX01MTF	Matrix Computation and Applications
13	U24OEX01MTA	Reliability Theory
14	U24OEX01MTB	Numerical Methods for Partial Differential Equations
15	U24OEX01MTZ	Any other course approved by BoS Chair and Dean AA

(XIII) ENGLISH : EN-MOPEC BASKET

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

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

(XIV) PHYSICS: PY-MOPEC BASKET

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

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

(XV) CHEMISTRY : CY-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01CYA	Nano Bio-Technology
2	U24OEX01CYB	Computational Chemistry
3	U24OEX01CYC	Biosensors and Applications
4	U24OEX01CYD	Fundamentals of Quantum Chemistry
5	U24OEX01CYE	Stereochemistry
6	U24OEX01CYF	Advanced Polymer Chemistry

7	**U24OEX01CYG**	Principles and Applications of NMR Spectroscopy
8	**U24OEX01CYH**	Organic Reaction Mechanisms
9	**U24OEX01CYI**	Basic Organic Chemistry
10	**U24OEX01CHZ**	Any other course approved by BoS Chair and Dean AA

(XVI) COMMERCE & MANAGEMENT : CM-MOPEC BASKET

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

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

(XVII) LIBERAL ARTS* : LI-MOPEC BASKET

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

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

* Through MOOCs only

(XVIII) ARTS*: AR-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	**U24OEX01ARA**	Anthropolgy
2	**U24OEX01ARB**	Ancient India
3	**U24OEX01ARC**	Constitution of INDIA
4	**U24OEX01ARD**	Medieval India
5	**U24OEX01ARE**	Geography
6	**U24OEX01ARF**	Modern India

7	**U24OEX01ARG**	Indian Polity
8	**U24OEX01ARH**	Indian Economy
9	**U24OEX01ARZ**	Any other course approved by BoS Chair and Dean AA

* Through MOOCs only

(XIX) LAW*: LW-MOPEC BASKET

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

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

(XX) I²RE : IE-MOPEC BASKET

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

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

PROGRAM ELECTIVE COURSES (PEC)

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

Each major specialization of the B. Tech Programme is treated as a vertical.

PROGRAM ELECTIVE COURSES - VERTICALS

VERTICAL/ PE	PE1	PE2	PE3	PE4
VERTICAL 1: Cyber Security	U24IT601A: Block Chain Technologies	U24IT702A: Distributed Computing and Cloud Security	U24IT802A: Ethical Hacking	U24IT803A: Computer Forensics
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 2: Artificial Intelligence& Machine Learning	U24IT601B: Generative Artificial Intelligence	U24IT702B: Computer Vision & Image Processing	U24IT802B: Natural Language Processing	U24IT803B: Deep Learning
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 3: Computer Networks	U24IT601C: Advanced Computer Networks	U24IT702C: Mobile Computing	U24IT802C: Adhoc Sensor Networks	U24IT803C: Wireless Networks
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 4: High Performance Computing	U24IT601D: Parallel Programming	U24IT702D: High Performance Computing Architecture	U24IT802D: Fog & Edge Computing	U24IT803D: Augmented Reality &Virtual Reality
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 5: Internet of Things	U24IT601E: Applications of IoT	U24IT702E: Industrial IoT	U24IT802E: Privacy and Security in IoT	U24IT803E: IoT Architectures and Protocols
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			

1st Semester Syllabi

B. Tech (IT) –CURRICULUM & SYLLABUS (KITSW-URR24)

Abbreviations

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

I SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
-	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 *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
3	ESC	U24IT103	Digital Logic Design	2	1	-	4	7	3
4	PCC	U24IT104	Programming for Problem Solving with C	2	1	2	5	10	4
5	HSMC	U24MH105	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA106	Sports & Yoga	-	-	2	2	4	1
7	ESC	U24ME107	Engineering Graphics through CAD	-	-	2	2	4	1
8	ELC	U24EL108	Practicum - 1	-	-	-	4	4	1
9	VAC	U24VA109 XXXXX	SEA – I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
			Total:	10	4	8	34	56	21
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

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):

This course will develop students' knowledge in /on…

LO1: convergence of an infinite series and differential calculus

LO2: partial differentiation and its applications

LO3: differential equations of first order and first degree along with certain applications

LO4: higher order linear differential equations and applications

UNIT-I	9 Hrs

Infinite Series: Sequences, Series, General properties of series, Series of positive terms, Comparison tests-Limit form, Integral test, D'Alembert's Ratio test, Cauchy's root test

Differential Calculus and its applications: Fundamental theorems-Rolle's theorem (Geometrical interpretation), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem, Taylor's theorem (Generalized mean value theorem), Expansions of functions- Maclaurin's series, Taylor's series, Maxima and Minima-Conditions, Practical problems (rectangle, right circular cylinder, cone)

Self-Learning Topics (SLTs): *Review of basic concepts of limit, continuity and differentiability [Reference 1: topic (3.1,3.2,3.5,4.1)], Alternating series [(Text 1: topic 9.12, Solved problems: 9.16,9.17, Practice problems: exercise 9.7(1, 7)], Additional problems on fundamental theorems [(Text 1: topic 4.3, Solved problems: 4.13(i),4.14,4.17, Practice problems: exercise 4.4 (1(i),1(ii), 3(ii), 10(i), 10(ii))], Additional problems on Maclaurin's series [(Text 1: topic 4.4, Solved problems: 4.20, Practice problems: exercise 4.5 (3, 5)]*

UNIT-II	9 Hrs

Partial differentiation and its applications: Functions of two or more variables, Partial derivatives, Total derivative, Change of variables, Jacobians, Functional relationship, Geometrical Interpretation-Tangent plane and Normal to a surface, Taylor's theorem for function of two variables (without proof), Errors and approximations, Total differential, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers, Differentiation under the integral sign

Self-Learning Topics (SLTs): *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 methods 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	9 Hrs

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	**9 Hrs**

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* $Q(X) = X^m V(X)$ $X^m V(x)$[*(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 students 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*, 44th ed., Delhi : Khanna Publishers, 2017

Reference Book(s):

1. Shanti Narayan, Dr. Mittal P.K, *Differential Calculus*, 1st ed., New Delhi : S. Chand & Co., 2014
2. Kreyszig E, *Advanced Engineering Mathematics*, 10th ed., UK : John wiely & sons, 2020
3. S. S. Sastry, *Engineering Mathematics*, Vol. 2, 3rd ed. New Delhi, India: PHI Learning Pvt. Ltd., 2008.

Web and Video link(s):

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

Course Articulation Matrix (CAM):		**U24MH101 - DIFFERENTIAL CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24MH101.1**	2	2	1	1	-	-	1	-	1	-	1	1	-
CO2	**U24MH101.2**	2	2	1	1	-	-	1	-	1	-	1	1	-
CO3	**U24MH101.3**	2	2	1	1	-	-	1	-	1	-	1	1	-
CO4	**U24MH101.4**	2	2	1	1	-	-	1	-	1	-	1	1	-
U24MH101		**2**	**2**	**1**	**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, Electrodepotential, Electrochemical series, Nernst equation; Potentiometric titrations - Acidbase 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: topic 5.1), Ohms law (Text 1: topic 5.5)*

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 – Cathodicprotection - Impressed current cathodic protection, Sacrificial anodic protection

Self Learning Topics (SLTs): *Units of hardness(Text1: topic 1.5), Introduction to corrosion (Text 1: topic 7.1)*

UNIT-III **9 Hrs**

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

Spectroscopy: Introduction to spectroscopy, Microwave spectroscopy - Principle, Selection rules, Applications; Infra-red spectroscopy - Principle, Selection rules, Applications; UV Spectroscopy – Lambert - Beer's law and its applications

Self Learning Topics (SLTs): *Introduction to nanotechnology (Text 1: topic 37.1), Electromagnetic spectrum (Text 1: topic 35.1)*

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: topic 3.6); Aalternative solvents for green synthesis (Text 2: 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 (CH_3COOH) by conductometry using standard sodium hydroxide (NaOH)
8. Standardization of strong acid hydrochloric acid (HCl) by potentiometry using standard sodium hydroxide (NaOH)
9. Colorimetric analysis-verification of Lambert-Beer's law
10. Estimation of ferrous (Fe^{2+}) ion in the given solution using potassium permanganate
11. Preparation of nanoparticles of cadmium sulphide (CdS)
12. Synthesis of polymer (phenol- formaldehyde)

Text Book(s):

1. Jain and Jain, *Engineering Chemistry*, 17th ed., New Delhi, India: Dhanpat Rai Publishing Company, 2019 (Chapters 1, 3, 5, 6, 7, 35, 36, 37)
2. D. A. Dornfeld, *Green Manufacturing: Fundamentals and Applications*, 1st ed. New York, NY, USA: 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., 1st ed., New Delhi, India: Tata McGraw-Hill Publishing Co. Ltd., 2001
2. S. Chawla, *A Textbook of Engineering Chemistry*, 3rd ed., New Delhi, India: Dhanpat Rai & Co., 2003
3. S. S. Dara and S. S. Umare, *A Textbook of Engineering Chemistry*, 12th ed., New Delhi, India: 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 and Record Book,* Department of PS, KITSW

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: apply the concepts of electrochemical energy systems for batteries and fuel cells
CO2: interpret suitable techniques of water analysis and corrosion treatment of solid materials
CO3: apprise manufacturing of engineering materials and spectroscopic techniques of chemical analysis
CO4: apprise the synthesis, applications of engineering materials and principles of green chemistry

(based on psychomotor skills acquired from laboratory component)

CO5: determine water quality parameters-alkalinity, hardness
CO6: make use of analytical instruments for chemical analysis
CO7: determine metals present in their ores
CO8: design the synthesis of nanomaterial and polymer

Course Articulation Matrix (CAM):		**U24CY102B - ENGINEERING CHEMISTRY (*Common to CSM, CSD, CSN, CSO & IT*)**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24CY102B.1**	2	-	-	-	1	1	1	-	1	-	1	-	-
CO2	**U24CY102B.2**	2	-	-	-	1	1	1	-	1	-	1	-	-
CO3	**U24CY102B.3**	2	-	-	-	1	1	1	-	1	-	1	-	-
CO4	**U24CY102B.4**	2	-	-	-	1	2	1	-	1	-	1	-	-
CO5	**U24CY102B.5**	2	1	-	-	-	1	1	-	1	-	1	-	-
CO6	**U24CY102B.6**	2	1	-	-	2	1	1	-	1	-	1	-	-
CO7	**U24CY102B.7**	2	1	-	-	-	1	1	-	1	-	1	-	-
CO8	**U24CY102B.8**	2	1	-	-	-	1	1	-	1	-	1	-	-
U24CY102B		**2.00**	**1.00**	**-**	**-**	**1.20**	**1.12**	**1.00**	**-**	**1.00**	**-**	**1.00**	**-**	**-**

DIGITAL LOGIC DESIGN

Class: B.Tech. I –Semester			**Branch**	**:**	IT
Course Code	**:**	**U24IT103**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-1-0-4-7**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:**	**36 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: number systems & binary codes, binary arithmetic

LO2: boolean algebra and logic gates, gate level minimization

LO3: combinational circuits design, logic gates & adders and subtractors

LO4: sequential circuits design, flip flops, registers and counters

UNIT-I	**9 Hrs**

Number Systems and Codes: Review of number systems, Number-Base conversions, Octal and Hexadecimal numbers, Complements of numbers, Signed binary numbers, Binary codes, Binary weighted and non-weighted codes, Error detecting and error correcting codes

Binary Arithmetic: Addition, Subtraction, Multiplication-Long hand multiplication, Booth multiplication, Fast multiplication, Division-Restoring integer division, Non-Restoring integer division

Self Learning Topics (SLTs): *Binary storage and registers (Text1: topics 1.8), Arithmetic operations on floating-point numbers (Text2: topic 9.7.1), Practice Problems (Text1: Prob 1.3, Prob 1.7, Prob 1.9 to 1.21)*

UNIT-II	**9 Hrs**

Boolean Algebra and Logic Gates: Basic definitions, Axiomatic definition of boolean algebra, Basic theorems and properties of boolean algebra, Boolean functions, Canonical and standard forms, Other logic operations, Digital logic gates

Gate Level Minimization: The map method, Four - variable K-Map, Minimization using K-Map, Quine Mc'Clusky method

Self Learning Topics (SLTs): *Basic theorems and properties of boolean algebra (Text1: topic 2.4), Practice Problems (Text1: Prob 2.1 to 2.4, Prob 2.13, Prob 2.19 to 2.22, Prob 3.1 to 3.7)*

UNIT-III	**9 Hrs**

Design of Combinational Circuits: Combinational circuits, Analysis procedure, Design procedure, Binary adder–subtractor, Decimal adder, Magnitude comparator, Decoders, Encoders, Multiplexer, Realization of switching functions using multiplexers and decoders

Self Learning Topics (SLTs): *Design of code converters (Reference1: topic 7.12), Expansion of decoders (Reference1: topic 7.16), BCD to 7-Segment Decoders (Reference1: topic 7.17), Expansion of MUXs (Reference1: topic 7.22)*

UNIT-IV	**9 Hrs**

Sequential Circuits: Sequential circuits**,** Storage elements-Latches, Flip-Flops: SR flip flop, JK flip flop, D flip flop, T flip flop and Master-slave flip flop, Analysis of clocked sequential circuits, Registers, Shift registers, Ripple counters, Synchronous counters, Ring counter, Johnson counter

Self Learning Topics (SLTs): *Conversion of flip flops (Reference1: topic 8.8)*

Course Learning Outcomes (COs)

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

CO1: solve number base conversion problems and perform binary arithmetic
CO2: apply minimization techniques to minimize boolean algebraic expression
CO3: construct combinational circuits using logic gates and adders & subtractors
CO4: build the sequential circuits using flip flops and logic gates

Text Book(s):

1. M. M. Mano and M. D. Ciletti, *Digital Design: With an Introduction to the Verilog HDL*, 5th ed., Upper Saddle River, NJ, USA: Pearson Education, 2013 (Chapters 1,2,3,4,5,6)
2. C. Hamacher, Z. Vranesic, S. Zaky, and N. Manjikian, *Computer Organization and Embedded Systems*, 6th ed., New York, NY, USA: McGraw-Hill Education, 2012 *(Chapter 9)*

Reference Book(s):

1. A. Anand Kumar, *Switching Theory and Logic Design*, 1st ed., New Delhi, India: PHI Learning Pvt. Ltd., 2014
2. G. K. Kharate, *Digital Electronics*, 1st ed., New Delhi, India: Oxford University Press, 2012
3. R. P. Jain, *Modern Digital Electronics*, 4th ed., New Delhi, India: McGraw-Hill Education (India) Pvt. Ltd., 2010
4. S. C. Lee and B. S. Sonde, *Digital Circuits and Logic Design*, 1st ed., Englewood Cliffs, NJ, USA: Prentice-Hall, 1976

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc24_ee147/course; *NPTEL Video Lecture on Digital Circuits by Prof. Santanu Chattopadhyay, Professor of E&ECE, IIT Kharagpur*
2. https://onlinecourses.nptel.ac.in/noc21_ee10/preview; *NPTEL Video Lecture on Digital Electronic Circuits by Prof. Goutham Saha, Professor of E&ECE, IIT Kharagpur*

Course Articulation Matrix (CAM):		**U24IT103 - 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	**U24IT103.1**	2	2	1	-	-	-	1	-	1	-	1	1	-
CO2	**U24IT103.2**	2	2	1	-	-	-	1	-	1	-	1	1	-
CO3	**U24IT103.3**	2	2	2	1	-	-	1	-	1	-	1	1	-
CO4	**U24IT103.4**	2	2	2	2	-	-	1	-	1	-	1	1	-
U24IT103		**2**	**2**	**1.5**	**1.5**	**-**	**-**	**1**	**-**	**1**	**-**	**1**	**1**	**-**

PROGRAMMING FOR PROBLEM SOLVING WITH C

Class: B.Tech. I –Semester			**Branch**	**:**	IT
Course Code	**:**	**U24IT104**	**Credits**	**:**	**4**
Hours/Week (L-T-P-O-E)	**:**	**2-1-2-5-10**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:**	**60 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs) :

This course will develop students' knowledge in /on…

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

LO2: control structures and array operations

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

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

THEORY COMPONENT

UNIT-I	**9 Hrs**

Introduction to Programming: Art of programming through algorithms and flowcharts

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

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

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

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

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

UNIT-II	**9 Hrs**

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

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

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

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

UNIT-III	**9 Hrs**

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

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

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

UNIT-IV	**9 Hrs**

Structures and Unions: Defining a structure, Declaring and initializing structure variables, Accessing structure members, Array of structures, Structures within structures, Unions

Pointers: Understanding pointers, Declaring and initializing pointer variables, Pointer expressions, Pointers and arrays, Pointers and character strings, Pointers to functions, Pointers and structures

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

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

LABORATORY COMPONENT

List of Experiments

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

Text Book(s):

1. E. Balagurusamy, *Programming in ANSI C*, 8th ed., New Delhi, India: McGraw Hill Education (India), 2022

Reference Book(s):

1. P. Deitel and H. Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, 9th ed., Harlow, England: Pearson Education Limited, 2022
2. B. W. Kernighan and D. M. Ritchie, *The C Programming Language*, 2nd ed., New Delhi, India: Pearson Education India, 2015
3. R. Thareja, *Programming in C*, 3rd ed., New Delhi, India: Oxford University Press, 2023
4. Y. Kanetkar, *Let Us C*, 19th ed., New Delhi, India: BPB Publications, 2022
5. A. K. Sharma, *Computer Fundamentals and Programming in C*, 2nd ed., Hyderabad, India: Universities Press, 2018

Web and Video link(s):

1. 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.*
2. https://nptel.ac.in/courses/106104128 *NPTEL Video Lecture on Introduction to Programming in C by Prof. Satyadev Nandakumar, Professor of CSE, IIT Kanpur*

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: enumerate programming development steps, design an algorithm and draw 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):		**U24IT104: PROGRAMMING FOR PROBLEM SOLVING WITH C**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	PO 8	PO 9	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24IT104.1**	2	1	1	1	-	-	1	-	1	-	2	1	2
CO2	**U24IT104.2**	2	2	2	1	-	-	1	-	1	-	2	2	2
CO3	**U24IT104.3**	2	2	3	1	-	-	1	-	1	-	2	2	2
CO4	**U24IT104.4**	2	2	3	2	-	-	1	-	1	-	2	2	2
CO5	**U24IT104.5**	1	1	1	1	1	-	1	1	1	-	2	1	2
CO6	**U24IT104.6**	1	2	2	2	1	-	1	1	1	-	2	2	2
CO7	**U24IT104.7**	1	2	3	2	1	-	1	1	1	-	2	2	2
CO8	**U24IT104.8**	1	2	3	2	1	-	1	1	1	-	2	2	2
U24IT104		**1.5**	**1.75**	**2.25**	**1.5**	**1**	**-**	**1**	**1**	**1**	**-**	**1**	**1.75**	**2**

ENGLISH COMMUNICATION AND REPORT WRITING

Class: B.Tech. I–Semester			**Branch:** Common to all branches		
Course Code	**:**	**U24MH105**	**Credits**	**:**	**2**
Hours/Week(L-T-P-O-E)	**:**	**2-0-0-3-5**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:**	**36 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

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: a bridging varieties of lengthy texts and maintaining emotional balance.

UNIT-I	**9Hrs**

Grammar : Tenses, Structures, usage, examples, exercises for practice; Sentence correction, Correct use of tenses, Verb forms, Punctuation

Vocabulary : Word formation: Prefixes, Suffixes, Sentence Formation with newly formed words

Reading Skill : Definition, Sub skills of reading, Emphasis on skimming, Purpose, How to skim through the text, Examples, Exercises for practice

Writing Practices: Paragraph Writing, Definition, Organizing Principles of paragraphs, Making a paragraph through hints/graphs and pictures, Coherence, Linking devices, Systematic development of ideas; Paraphrasing, Précising lengthy expressions for clarity and brevity

Life Skills: Ethical values and humanity, The Last Leaf: A Short story by O.Henry

Self Learning Topics (SLTs): *Articles - (Text2, Unit-II), English vocabulary (Text2: Unit I to III), Verb forms (Refer: topic 31), Tenses (Refer : topics: 16, 17, 18, 19), Reported Speech (Reference2: topics 161-167)*

UNIT-II	**9 Hrs**

Grammar : Tenses, Revision, Exercises for practice; Subject, Verb agreement, Reported speech, Transformation; Sentence correction, Emphasis concord, Report speech, Sentence structures

Vocabulary : Synonyms, Antonyms, Single word substitutes - Popular abbreviations

Reading Strategy: Emphasis on scanning the text, Purpose, Advantages, Examples, Exercises and Practice through Teamwork

Writing Practices: Letter writing, Effective letter writing techniques, Information seeking letters, Job application letters, Apology letters, Explanation to memos, E-mails, Cover Letters, Resume

Life Skills: Determination, How I Became a Public Speaker: An essay by George Bernard Shaw

Self Learning Topics (SLTs): *English vocabulary (Text2 : Unit-I to III), Tenses (Reference3 : topic 30, Exercises 30.1 to 30.3)*

UNIT-III	**9 Hrs**

Grammar: Tenses, Revision, Exercises for practice; Nouns, Prepositions, Adverbs, Adjectives

Sentence Correction: Correct Use of tenses, nouns, prepositions, adverbs and adjectives

Vocabulary: Phrasal verbs, Technical words, Latin words

Reading Strategy: Intensive reading, Purpose, Types of comprehension questions, Examples,

Exercises and practice through teamwork

Writing Practices: Report writing, Definition, Purpose, Qualities of a good report, Formal and informal reports, Report format, Sample reports, Exercises, Emphasis on technical reports

Life Skills:PositiveAttitude; Be the best of whatever you are: A poem by Douglas Malloch

Self Learning Topics(SLTs): *Parts of speech(Text1: Unit-I), Tenses (Reference1: topics 16 to 19), Phrasal verbs (Reference 3)*

UNIT-IV	**9 Hrs**

Grammar: Tenses, Revision, Exercises for Practice; Clauses, Conjunctions, Transformation of Sentences; Sentence correction (Based on parts of speech), Clauses, Tenses

Vocabulary: Appropriate use of words in communication, Commonly confused words

Active Reading and Note-Making: Note, Making, Definition, Purpose, Effectiveness

Writing Practices: Précis writing, Definition, Purpose, Uses, Examples and exercises, Practice through teamwork; Preparing statement of purpose (SoP)

Life Skills: Emotional balance a poison tree: Poem by William Blake

Self-Learning Topics(SLTs): *Tenses (Refer2: Topics 152-157)*

Course Learning Outcomes(COs):

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

- **CO1:** apply basic grammar principles in speech and writing, read fast, form new words, make coherent paragraphs and adapt the real value of life
- **CO2:** create effective letters, e-mails, reply to Memos and do the given tasks with confidence
- **CO3:** analyze the given texts and write clear and unambiguous reports
- **CO4:** deduct the superfluous information from lengthy text, prepare SoP (Statement of Purpose) effectively and solve critical problems in life with emotional balance

Text Book(s):

1. S. Kumar and P. Lata, *English Language and Communication Skills for Engineers*, 1st ed., New Delhi, India: Oxford University Press, 2018
2. Orient BlackSwan, *Language and Life: A Skills Approach*, 2nd ed., Hyderabad, India: Orient BlackSwan Pvt. Ltd., 2019

Reference Book(s):

1. A. J. Thomson and A. V. Martinet, *A Practical English Grammar*, 3rd ed. Oxford, UK: Oxford University Press, 1997
2. A. J. Thomson and A. V. Martinet, *A Practical English Grammar: Exercises 2*, 3rd ed. Oxford, UK: Oxford University Press, 1997
3. W. S. Allen, *Living English Structure*, 5th ed. New Delhi, India: Pearson Education India, 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, StMary's College Trissur

Course Articulation Matrix (CAM):		U24MH105: 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	PSO 1	PSO 2
CO1	U24MH105.1	-	-	-	-	-	1	2	2	2	1	2	-	-
CO2	U24MH105.2	-	-	-	-	-	1	2	2	2	1	2	-	-
CO3	U24MH105.3	-	-	-	-	-	1	2	2	2	1	2	-	-
CO4	U24MH105.4	-	-	-	-	-	1	2	2	2	1	2	-	-
U24MH105		-	-	-	-	-	1	2	2	2	1	1	-	-

SPORTS /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:	**48 Hrs**	**ESE:**	**40 %**

Course Learning Objectives (LOs):

This course will enable students to…

LO1: know about Yoga and its Benefits

LO2: develop skills and techniques of various Sports &Games.

LO3: inculcate Sportsman spirit.

LO4: all round development of the students to meet the requirements of the society.

Sports and Games

List of Sports and Games

1	Badminton	2	Basket Ball	3	Chess
4	Carrom	5	Foot Ball	6	Table Tennis
7	Volley Ball	8	Cricket	9	Hand Ball
10	Kabaddi	11	Kho-Kho	12	Yoga Aasanas

Text book(s):

1. J. Downey, *Badminton for Schools*, New Delhi, India: S. Chand & Company Ltd., 159 pp.
2. O. P. Sharma, *Basketball Skills & Rules*, New Delhi, India: Khel Sahitya Kendra, 166 pp.
3. J. Silman, *How to Reassess Your Chess: Chess Mastery Through Chess Imbalances*, 4th ed., Los Angeles, CA, USA: Silman-James Press, 2010, 658 pp.
4. O. P. Sharma, *Football Skills & Rules*, New Delhi, India: Khel Sahitya Kendra, 215 pp.
5. D. Jain, *Teaching & Coaching Table Tennis*, New Delhi, India: Khel Sahitya Kendra, 196 pp.
6. D. James, *Volleyball for Schools*, New Delhi, India: S. Chand & Company Ltd., 125 pp.
7. T. N. Pramanik, *Yoga Education*, New Delhi, India: Sports Publication, 347 pp.
8. G. Viswanath (Ed.), *Indian Cricket 1999*, 53rd ed., Chennai, India: Kasturi & Sons Ltd., 784 pp.
9. A. K. Srivastava, *Health and Fitness*, New Delhi, India: Sports Publication, 72 pp.
10. E. Prasad Rao, *Modern Kabaddi*, New Delhi, India: D.V.S. Publications.

Reference Book(s):

1. B. K. Chaturvedi, *Rules and Skills of Games and Sports*, 1st ed., New Delhi, India: Goodwill Publishing House, n.d.
2. L. C. Wei, *Dare to Be a Champion*, 1st ed., Selangor, Malaysia: Bukuganda Digital & Publication, Jan. 2012, 199 pp.
3. B. Simmons, *The Book of Basketball: The NBA According to the Sports Guy*, 1st ed., New York, NY, USA: ESPN Books, 2009.
4. J. Silman, *How to Reassess Your Chess: Chess Mastery Through Chess Imbalances*, 4th ed., Los Angeles, CA, USA: Silman-James Press, 2010, 658 pp.
5. R. Gaudin, *The Stars of Football: The World's Best Players*, Kindle ed., n.p.: Amazon Digital Services, n.d.

6. B. Bertucci, M. Katsumoto, Y. Nakanishi, and T. Yoshida, *The Complete Volleyball Handbook*, Kindle ed., 1st ed., n.p.: Amazon Digital Services, n.d.
7. V. Thani, *Cricket Skills & Rules*, 1st ed., New Delhi, India: Khel Sahitya Kendra, 202 pp.
8. J. P. Muller, *Health, Exercise and Fitness*, 1st ed., New Delhi, India: Sports Publication, 117 pp.
9. T. Thangamani and T. G. V. Rajkumar, *Yogic Science*, 1st ed., New Delhi, India: Physical Education & Sports Books, 274 pp.

Web and Video link(s):

1. Badminton game Video Link : https://www.youtube.com/watch?v=HucIqi8Lw3E&t=22s
2. Basket Ball game Video Link : https://www.youtube.com/watch?v=-tkE2lJoR58
3. Chess Video Link : https://www.youtube.com/watch?v=mDw7lgM8ePo
4. Carrom game Video Link : https://www.youtube.com/watch?v=z8vvJpNceeg
5. Football game Video Link : https://www.youtube.com/watch?v=mXjW78AgGu4
6. Table Tennis game Video Link: https://www.youtube.com/watch?v=bLrJGWvWI4U
7. Volleyball game Video Link : https://www.youtube.com/watch?v=BJJb3-O0Q1U
8. Cricket game Video Link : https://www.youtube.com/watch?v=87hO_Vs3-wQ
9. Handball game Video Link : https://www.youtube.com/watch?v=VCa_0USaq8k
10. Kabaddi game Video Link : https://www.youtube.com/watch?v=ai1m7ARNyNI
11. Kho-Kho game Video Link : https://www.youtube.com/watch?v=P3_z3LKdLdg
12. 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,

CO1: demonstrate physical fitness by performing Yoga – Asanas
CO2: demonstrate physical fitness through various games & sports events with defined bench marks
CO3: demonstrate Sportsman spirit and ethics
CO4: demonstrate Physical, Psychological, Social and Emotional balance

ESE: 40 Marks

		Grade-P (50%)	Grade-D (60%)	Grade-C (70%)	Grade-B (80%)	Grade-A (90%)	Grade-S (100%)
50 mts / 30 mts (Sprint)	Women	11sec above	10-11 sec	9-10 sec	8-9 sec	7-8 sec	7 sec below
		5	6	7	8	9	10
	Men	11sec above	10-11 sec	9-10 sec	8-9 sec	7-8 sec	7 sec below
		5	6	7	8	9	10
Jump (Standing Broad Jump)	Women	0.90 – 1 mts	1.00 – 1.25 mts	1.25 – 1.50 mts	1.5 – 1.75 mts	1.75 – 2 mts	2 mts above
		5	6	7	8	9	10
	Men	1.50 – 1.7 mts	1.7 – 1.9 mts	1.90 – 2.1 mts	2.30 – 2.1 mts	2.5 – 2.7 mts	2.70 mts above
		5	6	7	8	9	10
Throw (Shot-put)	Women	3.5-4.0mts	4.0-4.5mts	4.5.5.0mts	5.0-5.5mts	5.5-6.0mts	6.0-6.5mts
		5	6	7	8	9	10
	Men	4.0-5.0mts	5.0-6.0mts	6.0-7.0mts	7.0-8.0mts	8.0-9.0mts	9mts above
		5	6	7	8	9	10
Yoga Aasanas (Surya Namaskaras)	Women	2 repetition (12min)	3 repetition (18min)	4 repetition (24min)	5 repetition (30min)	6 repetition (36min)	7 repetition (42min)
		5	6	7	8	9	10
	Men	2 repetition (12min)	3 repetition (18min)	4 repetition (24min)	5 repetition (30min)	6 repetition (36min)	7 repetition (42min)
		5	6	7	8	9	10

CIE-60

	Grade-P	Grade-D	Grade-C	Grade-B	Grade-A	Grade-S
Attendance %	40-50%	50-60%	60-70%	70-80%	80-90%	90-100%
Marks	10	12	14	16	18	20
Performance in Regular Participation in classes : 15						
Performance in Selected Event : 25						

SPORTS AND YOGA FOR ALL BRANCHES-U24VA106

COs	Pos	Justification for mapping(Students will be able to)	Level of mapping
CO1:demonstrate physical fitness by performing Yoga-Asanas	PO11	Performing Yoga Aasanas and make it habituated as a life long process, so that one can improve concentration levels through better mind-body co-ordination.	1
CO2: Demonstrate physical fitness through various games & sports events with defined benchmarks.	PO8	Engage in games and sports regularly thus promotes individual and team work.	1
CO3: demonstrate sportsman spirit and ethics.	PO7	Exhibit Sportsman Spirit and learn ethics through various games & sports to be a worthy citizen.	2
CO4: demonstrate Physical, Psychological, Social and Emotional balance.	PO9	Exhibit proper balance during emotions sportsman can communicate effectively with peers and can demonstrate physical, psychological, social skills effectively.	1
	PO11	Maintain physical, psychological, Social and emotional balance and make it as a lifelong process through Games and Sports.	1

Course Articulation Matrix (CAM):		**U24VA106 Sports / Yoga for all UG Branches**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	PO 8	PO 9	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24VA106.1**	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	**U24VA106.2**	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	**U24VA106.3**	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	**U24VA106.4**	-	-	-	-	-	-	-	-	1	-	1	-	-
U24VA106		-	-	-	-	-	-	2	1	1	-	1	-	-

ENGINEERING GRAPHICS THROUGH CAD

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

LABORATORY COMPONENT

List of Experiments

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

Text Book(s):

1. N. D. Bhatt, *Elementary Engineering Drawing*, 1st ed., Anand, India: Charotar Publishing House, 2017
2. D. M. Kulkarni, A. P. Rastogi, and A. Sarkar, *Engineering Graphics with AutoCAD*, Revised ed., New Delhi, India: PHI Learning Pvt. Ltd., 2010

Reference Book(s):

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

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs)

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

CO1: draw projections of points and straight lines inclined to one plane with Auto CAD.
CO2: develop the projections of planes using Auto CAD
CO3: construct the projections of solids and sections of solids using Auto CAD
CO4: create orthographic and isometric projections and develop the simple electrical and electronic circuit using Auto CAD

Course Articulation Matrix (CAM): U24ME107		**ENGINEERING GRAPHICS THROUGH CAD**												
CO		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	**U24ME107.1**	2	1	1	-	2	-	1	-	2	-	1	-	-
CO2	**U24ME107.2**	2	1	1	-	2	-	1	-	2	-	1	-	-
CO3	**U24ME107.3**	2	1	1	-	2	-	1	-	2	-	1	-	-
CO4	**U24ME107.4**	2	1	1	-	2	-	1	-	2	-	1	-	-
U24ME107		**2**	**1**	**1**	**-**	**2**	**-**	**1**		**2**	**-**	**1**	**-**	**-**

PRACTICUM

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3:preparingwell-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

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

(i). Practicum is a mandatory semester project work.

(ii). Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)

(iii). Allotment of Practicum topics for students:

- **Practicum matrix:** In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.

Course	U24MH101	U24CY102B	U24IT103	U24IT104	U24MH105
Students allotted to different courses	B24IT001	B24IT014	B24IT027	B24IT040	B24IT053
	B24IT002	B24IT015	B24IT028	B24IT041	B24IT054
	B24IT003	B24IT016	B24IT029	B24IT042	B24IT055
	B24IT004	B24IT017	B24IT030	B24IT043	B24IT056
	B24IT005	B24IT018	B24IT031	B24IT044	B24IT057
	B24IT006	B24IT019	B24IT032	B24IT045	B24IT058
	B24IT007	B24IT020	B24IT033	B24IT046	B24IT059
	B24IT008	B24IT021	B24IT034	B24IT047	B24IT060
	B24IT009	B24IT022	B24IT035	B24IT048	B24IT061
	B24IT010	B24IT023	B24IT036	B24IT049	B24IT062
	B24IT011	B24IT024	B24IT037	B24IT050	B24IT063
	B24IT012	B24IT025	B24IT038	B24IT051	B24IT064
	B24IT013	B24IT026	B24IT039	B24IT052	B24IT065

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

(Signature of class teacher)

****

(iv). ***To complete the practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and outside the class work hours during weekdays.***

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

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

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

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

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

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

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

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

(b) **Working Model**: Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.

(c) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include

answers to the following questions in the report and ppt presentation.

- What was the objective of the practicum assigned?
- What are the main responsibilities and tasks for practicum?
- What knowledge and skills from the coursework are applied in the practicum?
- What new knowledge and skills are acquired during the practicum?
- In what ways, can the practicum be helpful for the professional career?
- What gaps are identified in your practicum work?
- What improvements or changes you suggestfor addressing the identified gaps for future work?

(d) **Anti-Plagiarism Check:** The practicumreport 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 teacheras per the schedule notified by the department

(f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact

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

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

Course Learning Outcomes (COs):

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

CO1: synthesize literature survey, identify research gaps anddefine 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 practicumand make an effective oral presentation using PPTs

Course Articulation Matrix (CAM):		**U24EL108 PRACTICUM**												
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	**U24EL108.1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO2	**U24EL108.2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO3	**U24EL108.3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO4	**U24EL108.4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
U24EL108		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code U24ELXYY: ***X represents semester, YY represents ETA course serial number***

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA /SAA)			
Class: B.Tech. I Semesters	**Branch:** Common to all branches		
Course Code:	**U24VA109(SE/SA)ZZZ**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-0-2-2**	**CIE:**	**100%**
Total Number of Teaching Hours:	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: holistic development through activity-based learning to gain real-life experiencewhicheffectively help individualsdeal 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 presentationthrough PPTs portraying knowledge, skills,qualitiesacquired and social impact of the activity

Activity Based Liberal Learning about Life, Literature and Culture (ABLL@LLC) isintroduced 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 andsocial 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** (SelfAccomplishment Activities)

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

(a) Each SEA/SAA activity is treated as one credit course

(b) Student must select one activity per semester,through first 04 semesters, from the courses listed under SEA/ SAA, before commencement of the semester.

(c) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA

(d) To complete these activities student shall work outside the class work hours, during weekends, holidays, semester breaks, etc.,

(e) If a student is not able to attend/ fulfil performance requirements, he/she shall be dropped from the course and shall have to enrol in the forthcoming semesters.

Monitoring SEA/SAA:

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

(b) During the semester period, the student has to**acquire requisite knowledge**, **conduct fieldwork**, acquire skills and propose unique solutions to the real-life problems

(c) **Knowledge Acquisition& Skilling**:

i. Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity

ii. For the activities related to social awareness/issues/challenges that affect society, use the knowledge base, apply relevant skills to analyse the issue and propose unique possible solutions to the social issues/challenges. Practice to acquire necessary skills to seek new opportunities in their personal and professional life.

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

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

i. This student-driven Fieldwork allow students to interact with the 'real world'. It is an autonomous learning (self-learning) situation that students are more actively involved during the activity and develop a deeper understanding and develop a more positive attitude.

ii. Fieldwork consists of three phases: preparation, the actual activity and feedback

iii. As part of fieldwork, student has to interact with at least two eminent personalities/achievers/renowned persons/inspiring and great personalities related to the activity chosen.

iv. Fieldwork will benefit students for any careers where they need to work with communities of people or which involves analysis of complex processes, especially social and cultural.

v. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more

vi. Other skills important for fieldwork practice include the ability to act in a crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.

vii. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/ Achievers / Renowned personalities:

(a). **In case of socially relevant problems/ activities of SEA/SAA: E**minent 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 interacteminent personalities**: Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction

ix. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork

x. **Ethics of fieldwork**: Fieldwork is an educational process with commitment to positive values. All fieldwork should be planned and conducted in a way that is ethical, responsible and safe, for people, students, visited communities, if any, and all other stakeholders.Student is expected to maintain integrity and honesty. Avoid bias and deception. Protect the rights and well-being of people involved in fieldwork. The privacy, confidentiality and respect for the eminent people interacted should be maintained and their time, inputs & guidance are to be acknowledged

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

xii. Student should remember that contrary to a *field trip or company visit*, **the emphasis in fieldwork is on acquiring skills**, and not on casually presenting theory and assessing.

xiii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.

xiv. **Feedback:**The learnings the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.

- During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentationand 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 studentshall, identifiesminimum of4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

ii. ***Identification of goals and preparation of action plan:*** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity,

every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.

iii. ***Field work:*** Under the guidance of nodal centre, student shall complete the field work, based on the action plan, with the progress continuously monitored by the faculty counsellor and the nodal centre.

iv. ***Demonstration/ Presentation:*** After completion of field work, student shall demonstrate/present his achievements (knowledge/skills gained during the activity) at the nodal centre in the presence of external experts/senior practitioners of the activity. After successful demonstration/presentation, the nodal centre shall provide a certificate of completion indicating that the student has completed the activity in the stipulated time.

v. ***Report writing:*** After successful demonstration/presentation, student shall write a 2–3-page report and submit the same to the faculty counsellor. The report shall emphasize knowledge, skills and qualities acquired through the SEA/SAA activities. It shall also include the influence of these activities on enhancing confidence, positive change in life, decision making, transforming choices into desired actions/outcomes.

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

The CIE for SEA/SAA is as follows:

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

Note:

(a) **Presentation/ Demonstration:**It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule

notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.

(b) **Report:** Each student is required to submit a well-documented report on the chosen SEA/SAA topic as per the format specified by *department level SEA/SAA coordinator.*

(c) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.

(d) **Requirements for passing the course:** A student is deemed to have passed SEA/SAA if he/she

a. successfully demonstrates/presents the skills attained at the end of course as per the schedule notified by the nodal centre, **and**
b. scores a minimum of 40 marks in the CIE of the course

(e) **Supplementary examination:** If a student fails in SEA/SAA activity of a particular semester, he must complete the same by enrolling it in the next higher semesters.

Course Learning Outcomes (COs):

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

CO1: integrate the five dimensions of physical, emotional, cognitive, spiritual and social aspects in life for holistic development and demonstrate social 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 makinga well-documented report and an effective oral presentationwith PPTs portraying knowledge, skills, qualities acquired through fieldwork/practice sessions and social impact of the course learning

Text / Reference book(s):

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

Course Code: **U24VA XYY(SE/SA)ZZZ**

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

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

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

(a) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.

(b) Learning from industry experts with real-world examples,is important to enhance your educational experience.

(c) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximised if you are clear on the purpose of your developed competencies and how to apply them in a range of complex situations.

(d) Graduate employability could be enhanced through fostering lifelong learning, the development of a range of employability-related competencies and increased confidence and capacity in "reflecting on and articulating these capabilities and attributes in a range of recruitment situations".

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

(e) The answer is Industry**Expert Talk Series (ETS)**.Through ETS, we invite industry experts in different fields to deliver talks and interact with students.

(f) Through Industry expert talks students get to know so much more that textbooks don't explain.

(g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.

(h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses

(i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.

(j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability enhancement category of courses**.

(k) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.

(l) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.

(m) ETS enhances your learning in many ways for global opportunities for your career.

(n) All in all, learning from industry experts**,** is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.

(o) Salient features of ETS are hereunder:

(i) ETS is offered from I semester to VI semester.

(ii) ETS, in any given semester, is treated as one credit course

(iii) Students are required to earn six credits (from I to VI semester)

(iv) **Head, Centre for i²RE** shall be the **institute level ETS coordinator**

(v) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode**by the parent department / Centre for i²RE.

(vi) Each expert talk shall be for a minimum duration of 45 minutes (*but not exceeding 90 minutes*) followed by **online quiz/test** for 10 marks(10 MCQs/FiBs;*duration: 10-15 mins*), on the contents covered in the expert talk.

(vii) **The Head C-i²RE** shall share the marks obtained by the students in each of the quizzes / tests to the respective **department ETS coordinators.**

(viii) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.

(ix) **Report on ETS:**At the end of semester, the student shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.

(x) **Evaluation:**There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks

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

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

ii. Supplementary Exam:

(a) Student has to register for ETS supplementary examination if he/she scores less than 40 marksin CIE

(b) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks(MCQs/FiBs ; *duration: 2Hrs*)on the content covered in ETS lectures.

(c) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE

(d) Exam material/resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

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

CO1: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO2: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

CO3: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO4: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		**U24AE110** EXPERT TALK SERIES											
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	U24AE110.1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE110.2	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE110.3	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE110.4	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE110		**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

Course code U24AEXYY: ***X represents semester, YY represents ETA course serial number***

2nd Semester Syllabi

B. Tech (IT) –CURRICULUM & SYLLABUS (KITSW-URR24)

Abbreviations

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

II SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH201	Matrix Theory and Vector Calculus	2	1	-	6	9	3
2	BSC	U24PY202B	Engineering Physics *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
3	PCC	U24IT203	Computer Architecture and Organization	2	1	-	4	7	3
4	PCC	U24IT204	Data Structures through C	2	1	2	5	10	4
5	ESC	U24EE205B	Basic Electrical Engineering *(Common to CSM, CSD, CSN, CSO & IT)*	2	1	2	5	10	4
6	VAC	U24CH206	Environmental Studies	2	-	-	2	4	-
7	AEC	U24AE207	Idea Lab Makerspace	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210 XXXXX	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
			Total:	12	5	10	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)				-	-	-	-	-	-

MATRIX THEORY AND VECTOR CALCULUS

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: various methods of solving system of linear equations and eigen value problems
LO2: double integral, triple integral and their applications
LO3: vector differential calculus and applications
LO4: integration of vector valued functions and applications

UNIT-I	**9 Hrs**

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

Self-Learning Topics (SLTs): *Review of Matrices (Text 1: topics 2.1 to 2.5), PAQ –Normal form (Text 1, topic 2.7(7)), Solved problems: 2.26, Practice problems: exercise 2.4 (9,10), Additional problems on system of homogeneous and non-homogeneous equations (Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14)), Additional problems on Eigen values and eigen vectors (Text 2: topic 8.1, Solved problems: 8.1(1,2), Practice problems: exercise 8.1(4,6)), Nature of quadratic form [Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14))*

UNIT-II	**9 Hrs**

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

Self-Learning Topics (SLTs): *Review of integrals (Text 1: topic Appendix VII (1)), Additional problems on change of order of integration (Text 1: topic 7.2, Solved problems: 7.4, 7.6, Practice problems: exercise 7.1 (9,14)), Centre of gravity of a plane lamina (Text 1: topic 7.10, Solved problems 7.34, 7.35, Practice problems: exercise 7.6 (9,10)), Moment of Inertia of plane lamina [Text 1: topic 7.12(1,2), Solved problems: 7.37,7.38, Practice problems: exercise 7.7 (1,4)), Additional problems on volume of solids (Text 1: topic 7.6, Solved problem: 7.21, Practice problems: exercise 7.4 (12,25))*

UNIT-III	**9 Hrs**

Vector Calculus and its applications: - Vector Space, Linear dependent and independent vectors, Differentiation of vectors, Curves in space, Tangent, Principal normal, Binormal, Curvature, Torsion, Velocity and acceleration, Scalar and vector point functions, Del applied to scalar point functions - Gradient, Geometrical interpretation, Directional derivative, Del applied to vector point functions -Divergence, Curl, Physical interpretation of divergence, Physical interpretation of

curl, Del applied twice to point functions, Del applied to products of point functions, Decomposition of vector valued functions

Self-Learning Topics (SLTs): *Review of vectors (Text 2: topics 9.1, 9.2, 9.3), Vector identities (Text 1: topic 8.9, Solved problems: 8.22, 8.23, Practice problems: exercise 8.4 (13,14)), Additional problems on Directional derivatives (Text 1: topic 8.5(3), Solved problems: 8.13,8.14, Practice problems: exercise 8.3 (4,6,8,9))*

UNIT-IV	**9 Hrs**

Integration of vectors:

Line integral, Surfaces-Surface integral, flux across a surface, Green's theorem in the plane (without proof), Stoke's theorem (Relation between line and surface integrals) (without proof), Volume integral, Gauss divergence theorem (Relation between surface and volume integrals) (without proof), irrotational fields, solenoidal fields

Self-Learning Topics (SLTs): *Additional problems on Green's theorem [Text 1: topic 8.13, Solved problems: 8.33,8.35, Practice problems: exercise 8.8 (1,2,4)]*
Additional problems on Stoke's theorem [Text 1: topics 8.14, Solved problems: 8.39, 8.40, Practice problems: exercise 8.9 (1,2)]
Additional problems on Gauss Divergence theorem [Text 1: topic 8.16, Solved problems: 8.44,8.46, Practice problems: exercise 8.10 (1,2)]

Course Learning Outcomes (COs):

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

CO1: analyze eigen value problems using matrix theory
CO2: apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems
CO3: apply differential operators on vector and scalar point functions
CO4: solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems

Textbook(s):

1. B. S. Grewal, *Higher Engineering Mathematics*, 44th ed., New Delhi, India: Khanna Publishers, 2017 (Chapters 2,7,8)
2. Kreyszig, *Advanced Engineering Mathematics*, 10th ed., UK : John Wiley & Sons Inc., 2020 (Chapter 8(8.2))

Reference Book(s):

1. M. Spiegel, *Vector Analysis*, 2nd ed., New York, NY, USA: McGraw Hill (Schaum's Outline Series), 2017
2. S. S. Sastry, *Engineering Mathematics*, Vol. II, 3rd ed., New Delhi, India: Prentice Hall of India, 2014
3. G. Strang, *Introduction to Linear Algebra*, 5th ed., Wellesley, MA, USA: Wellesley-Cambridge Press, 2016

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	-
CO2	U24MH201.2	2	2	1	1	-	-	1	-	1	-	1	1	-
CO3	U24MH201.3	2	2	1	1	-	-	1	-	1	-	1	1	-
CO4	U24MH201.4	2	2	1	1	-	-	1	-	1	-	1	1	-
U24MH201		**2**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**1**	**1**	**-**

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):

This course will develop students' knowledge in /on…

LO1: basic principles, operation of lasers and optical fibers

LO2: fundamental laws of electrostatics and magnetostatics, properties of magnetic and superconducting materials

LO3: basic concepts of quantum mechanics and quantum computing

LO4: semiconductor materials, semiconductor diodes and bipolar junction transistors (BJTs)

THEORY COMPONENT

UNIT-I — 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(Text1: topic 1.9), types of waves(Text1: topic 1.10), reflection laws(Text1: 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 T_c 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	9 Hrs

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	9 Hrs

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, K. Kshirsagar, and T. V. S. Arun Murthy, *A Text Book of Engineering Physics*, 11th ed., New Delhi, India: S. Chand & Company Ltd., 2018
2. S. Salivahanan and N. Suresh Kumar, *Electronic Devices and Circuits*, New Delhi, India: McGraw Hill, 2017

3. M. A. Nielsen and I. L. Chuang, *Quantum Computation and Quantum Information*, Cambridge, U.K.: Cambridge University Press, 2010

Reference Book(s):

1. N. Gershenfeld, *The Physics of Information Technology*, 1st ed., Cambridge, U.K.: Cambridge University Press, 2000
2. V. Rajendran, *Engineering Physics*, 1st ed., New Delhi, India: McGraw Hill, 2013
3. E. Rieffel and W. Polak, *Quantum Computing: A Gentle Introduction*, 1st ed., Cambridge, MA, USA: The MIT Press, 2011
4. R. K. Gaur and S. L. Gupta, *Engineering Physics*, 1st ed., New Delhi, India: Dhanpat Rai & Sons, 2013
5. D. Halliday, R. Resnick, and J. Walker, *Fundamentals of Physics*, Vol. I & II, 5th ed., New Delhi, India: Wiley India Ltd., 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 students should be able to,

(based on cognitive skills acquired from theory component)

CO1: evaluate properties of lasers and optical fibre parameters

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

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

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

(based on psychomotor skills acquired from laboratory component)

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

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

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

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

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

COMPUTER ARCHITECTURE AND ORGANIZATION

Class: B.Tech. II -Semester		**Branch :** IT	
Course Code :	**U24IT203**	**Credits :**	**3**
Hours/Week (L-T-P-O-E) :	**2-1-0-4-7**	**CIE :**	**60 %**
Total Number of Teaching Hours :	**36 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: basic structure of computers and instruction set architecture

LO2: functional units of a processor

LO3: concepts of pipelining and performance evaluation

LO4: input/output (I/O) organization and main memory system

UNIT-I	**9 Hrs**

Basic Structure of Computers: Functional units, Basic operational concepts, Performance **Instruction Set Architecture:** Memory locations and addresses, Memory operations, Instructions and instruction sequencing, Addressing modes, Assembly language

Self Learning Topics (SLTs): *Register transfer notation, Assembly language notation (Text1: topics 2.3.1, 2.3.2), Practice problems (Text1: Prob 1.1, Prob 1.2,Prob 2.4), Solved problems on performance computation (Text1: Prob 1.9.1, Prob 1.9.2)*

UNIT-II	**9 Hrs**

Basic Processing Unit: Fundamental concepts, Instruction execution, Hardware components, Instruction fetch and execution steps, Control signals, Hard-wired control, CISC- style processors

Self Learning Topics (SLTs): *Program controlled I/O (Text1: topic 3.1.2), An example of a CISC-style I/O program(Text1: topic 3.1.4), Some fundamental concepts of processing unit (Text1: topic 5.1), Solved problems (Text1: 5.9)*

UNIT-III	**9 Hrs**

Pipelining: Basic concept, Pipeline organization, Pipelining issues, Data dependencies, Memory delays, Branch delays, Resource limitations, Performance evaluation, Superscalar operation, Pipelining in CISC processors

Self Learning Topics (SLTs): *Introduction to pipelining (Text1: topic 6.1), Effect of stalls and penalties (Text1: topic 6.8.1), Solved problems (Text1: topic 6.12)*

UNIT-IV	**9 Hrs**

Basic Input / Output: Accessing I/O devices, Interrupts

Input / Output Organization: Bus structure, Bus operation, Arbitration, Interface circuits, Interconnection standards

The Memory System: Basic concepts, Semiconductor RAM, Read-only memories, Direct memory access, Memory hierarchy, Cache memories, Performance considerations

Self Learning Topics (SLTs): *Single bus structure (Text1: topic 7.1), SATA, SAS, PCI Express (Text1: topics 7.5.4, 7.5.5, 7.5.6), Concepts of memory system (Text1: topic 8.1), Practice problems (Text1: topic 8.7)*

Course Learning Outcomes (COs)

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

CO1: identify functional units of a computer and compare the different addressing modes of instructions for execution

CO2: develop the control sequence for execution of an instruction

CO3: solve the problems on pipelining and implement synchronous and asynchronous schemes for transferring data

CO4: analyze memory access time to fetch instructions from main memory and basic input/output operations

Text Book(s):

1. C. Hamacher, Z. Vranesic, S. Zaky, and N. Manjikian, *Computer Organization and Embedded Systems*, 6th ed., New York, NY, USA: McGraw-Hill Education, 2012

Reference Book(s):

1. M. M. Mano, *Computer System Architecture*, 3rd ed., Delhi, India: Pearson Education, 2007
2. V. Rajaraman and T. Radhakrishnan, *Computer Architecture and Organization*, 4th ed., New Delhi, India: PHI Learning, 2011
3. R. B. Ram and S. Kumar, *Computer Fundamentals: Architecture and Organization*, 5th ed., New Delhi, India: New Age International Publishers, 2018

Web and Video link(s):

1. https://www.youtube.com/channel/UC2GUBG_WsP0OO5tXXocwp3Q/videos; *NPTEL Video Lectures on Computer Organization and Architecture- A Pedagogical Aspect by Dr.Arnab Sarkar, Professor of CSE, IIT Guwahati*
2. https://archive.nptel.ac.in/courses/106/105/106105163/; *NPTEL Video Lectures on Computer Architecture and Organization by Prof. Indranil Sengupta, Professor of CSE, IIT Kharagpur*
3. https://archive.nptel.ac.in/courses/106/106/106106092/; *NPTEL Video Lectures on Computer Organization by Prof. S. Raman, Professor of CSE, IIT Chennai*

Course Articulation Matrix (CAM):		**U24IT203 COMPUTER ARCHITECTURE AND ORGANIZATION**												
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	**U24IT203.1**	2	2	-	-	-	-	1	-	1	-	1	1	1
CO2	**U24IT203.2**	2	2	1	1	-	-	1	-	1	-	2	1	2
CO3	**U24IT203.3**	2	2	2	2	1	-	1	-	1	-	2	2	1
CO4	**U24IT203.4**	2	2	2	2	1	-	1	-	1	-	2	2	2
U24IT203		**2**	**2**	**1.66**	**1.66**	**1**	**-**	**1**	**-**	**1**	**-**	**1**	**1.5**	**1.5**

DATA STRUCTURES THROUGH C

Class: B.Tech. II –Semester		**Branch:** IT	
Course Code :	**U24IT204**	**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: time complexity, space complexity, array operations, and dynamic memory allocation
LO2: stacks and various forms of queues
LO3: various types of linked lists
LO4: various sorting techniques and hashing techniques

THEORY COMPONENT

UNIT-I	**9 Hrs**

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 (Text1: topics 2.4.3), passing arrays to functions and pointers (Reference1: topics 3.6, 3.7), Practice problems (Text1: Prob 2.3, Reference1: Prob 1,Prob 2,Prob 3, Prob 4)*

UNIT-II	**9 Hrs**

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 (Reference1: topics 7.7.3), priority Queue(Reference1: 8.4.3), Solved problems (Reference1: Prob 7.7.1, Prob 7.7.2), Practice problems (Text1: Prob 4.5, Prob 4.11, Prob 5.7, Prob 5.9)*

UNIT-III	**9 Hrs**

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 (Text1: topics 3.3), Skiplist (weblink: https://www.geeksforgeeks.org/skip-list/), Deallocation strategy(Text1: topic 3.9), Solved problems (Text1: Prob 3.6.1, Prob 3.6.2), Practice problems (Reference1: Prob 5.5, Prob 5.7, Prob 5.9)*

UNIT-IV	**9 Hrs**

Sorting Techniques: Selection sort, Insertion Sort, Shell sort and Radix sort, Time complexities of sorting

Hashing: Hashing techniques, Collision resolution techniques, Closed hashing, Open hashing, Comparison of collision resolution techniques

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

LABORATORY COMPONENT

List of Experiments

Experiment-I

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

Experiment-II

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

Experiment-III

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

Experiment-IV

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

Experiment-V

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

Experiment-VI

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

Experiment-VII

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

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

Experiment-VIII

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

Experiment-IX

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

Experiment-X

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

Experiment-XI

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

Experiment-XII

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

Textbook(s):

1. D. Samanta, *Classic Data Structures*, 2nd ed., New Delhi, India: Prentice Hall India, 2009

Reference Book(s):

1. R. Thareja, *Data Structures Using C*, 2nd ed., New Delhi, India: Oxford University Press, 2014
2. E. Balagurusamy, *Data Structure Using C*, 1st ed., New Delhi, India: McGraw Hill Education, 2017
3. R. F. Gilberg and B. A. Forouzan, *Data Structures: A Pseudocode Approach with C*, 2nd ed., Boston, MA, USA: Cengage Learning, 2007

Web and Video link(s):

1. 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 IT, KITSW.

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

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

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

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

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

(based on psychomotor skills acquired from laboratory component)

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

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

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

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

Course Articulation Matrix (CAM):		**U24IT204 DATA STRUCTURES THROUGH C**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	PO 8	PO 9	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24IT204.1**	2	2	2	1	-	-	1	-	1	-	1	2	1
CO2	**U24IT204.2**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO3	**U24IT204.3**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO4	**U24IT204.4**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO5	**U24IT204.5**	2	2	2	1	-	-	1	1	1	-	1	2	1
CO6	**U24IT204.6**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO7	**U24IT204.7**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO8	**U24IT204.8**	2	2	2	2	-	-	1	1	1	-	2	2	2
U24IT204		**2**	**2**	**2**	**1.75**	**-**	**-**	**1**	**1**	**1**	**-**	**1.75**	**2**	**1.75**

BASIC ELECTRICAL ENGINEERING

Class: B.Tech. II -Semester	**Branch:** Common to CSM, CSD,CSN,CSO & IT		
Course Code :	**U24EE205B**	**Credits :**	**4**
Hours/Week (L-T-P-O-E) :	**2-1-2-5-10**	**CIE :**	**60 %**
Total Number of Teaching Hours :	**60 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: network elements and DC circuits
LO2: DC network theorems
LO3: 1- Ø AC and 3-Ø AC circuits
LO4: construction, principles and applications of DC & AC machines and concept of Lighting sources

THEORY COMPONENT

UNIT-I	**9 Hrs**

DC circuits: Network elements, Linear & non-linear elements, Active & passive elements, Unilateral & bilateral elements, Ohm's law, Power, Energy, Kirchhoff's laws, Resistances connected in series and parallel, Voltage divider rule & Current divider rule

DC Circuit analysis: Source transformation, Star-Delta conversion, Mesh analysis & Nodal analysis (T & π networks only)

Self-Learning Topics (SLTs)*: Definitions of charge, current, & voltage (Text1: Topics1.2,), Solved problems (Text1: Prob 3.10, 3.11 & 3.12), Practice problems (Text1: Chap-3,Prob 4,5,7&8)*

UNIT-II	**9 Hrs**

DC network theorems (Independent sources only): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (T & π networks only)

Self-Learning Topics (SLTs): *Condition for maximum power transfer (Text1: Topics 3.9), Solved problems (Text1: Prob 3.15, 3.18, 3.23 & 3.25), Practice problems (Text1: Chap-3,Prob 9,10,13 & 14)*

UNIT-III	**9 Hrs**

1-Ø **AC circuits:** R.M.S value, Average value, Peak factor and form factor of a sine wave, Concept of phasor, Phase and phase difference, Rectangular and polar form representation, Sinusoidal steady state analysis of R, L, C, Series RL, RC, RLC circuits, Concept of Reactance, Impedance, Complex power, Real Power, Reactive power and Power factor

3- Ø AC circuits: Generation of 3- Ø voltages, Advantages, Disadvantages, Applications of a three-phase system, Voltage & current relationships of line and phase values for balanced star and delta connections

Self-Learning Topics (SLTs): *Expression for RMS & Average value (Text1: Topic, 4.4 & 4.5) Solved problems (Text1: Prob 4.10, 4.12, 4.13 & 4.14), Practice problems (Text1: Chap-4,Prob 8,9,12&12)*

UNIT-IV	**9 Hrs**

Electrical Machines & Electrical Lighting (Qualitative treatment):

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

Electrical lighting sources and Energy calculations:

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

Self-Learning Topics (SLTs): *EMF equation of a Transformer (Text1: Part-II Topic, 4.4.2) Solved problems (Text1: Part-II Prob 4.5, 4.6 & 4.7), Practice problems (Text1: Part-II Prob 5.2, 5.3 & 5.4), Practice problems (Text1: Part-II Prob 6, 7 & 8)*

LABORATORY COMPONENT

List of Experiments

1. Verification of voltage divider rule and current divider rule
2. Verification of Mesh Analysis
3. Verification of Nodal Analysis
4. Verification of Superposition Theorem
5. Verification of Thevenin's Theorem
6. Verification of Maximum power transfer Theorem
7. Determination of internal parameters of a choke coil
8. Impedance calculations and phasor representation of RL series circuit
9. Impedance calculations and phasor representation of RC series circuit
10. Load test on 1-phase transformer
11. Verification of Kirchoff's laws using PSPICE/MATLAB
12. **Interfacing Sensors with Arduino using TINKER CAD**
    i. LED blinking
    ii. IR Sensor
    iii. Ultrasonic Sensor
    iv. Voltage Sensor
    v. Current Sensor
    vi. Speed Sensor

Textbook(s):

1. K. U. Rao, *Basic Electrical Engineering*, 1st ed., New Delhi, India: Pearson Education, 2011

Reference Book(s):

1. B. L. Theraja and A. K. Theraja, *Electrical Technology Vol. I & II*, 1st ed., New Delhi, India: S. Chand & Company Ltd., 2005
2. E. Hughes, *Electrical & Electronics Technology*, 10th ed., New Delhi, India: Pearson Education, 2010.
3. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, 4th ed., New Delhi, India: Tata McGraw Hill, 2010.
4. A. Chakravarthy, S. Nath, and C. Kumar, *Basic Electrical Engineering*, 2nd ed., New Delhi, India: Tata McGraw Hill Ltd., 2009.

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

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

CO2 : apply suitable network theorems to analyze DC circuits

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

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

(based on psychomotor skills acquired from laboratory component)

CO5: validate mesh and nodal analysis

CO6: validate network theorems

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

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

Course Articulation Matrix (CAM):		**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	1
CO2	**U24EE205B.2**	2	2	-	-	-	-	1	1	1	1	**1**	1	1
CO3	**U24EE205B.3**	3	3	1	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	1
CO6	**U24EE205B.6**	2	2	-	-	-	-	1	1	1	1	**1**	1	1
CO7	**U24EE205B.7**	3	3	1	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

ENVIRONMENTAL STUDIES

(Common to ME, CSM, CSD, IT, CSN & CSO)

Class: B.Tech. II Semester		**Branch:** Common to ME, CSM, CSD, IT, CSN & CSO	
Course Code :	**U24CY206**	**Credits :**	**0**
Hours/Week(L-T-P-O-E) :	**2-0-0-2-4**	**CIE :**	**60%**
Total Number of Teaching Hours :	**24Hrs**	**ESE :**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in/on…

LO1: natural resources and their usage more equitably
LO2: ecosystem and the importance of biodiversity conservation
LO3: environmental pollution and it's control measures
LO4: environmental legislation and green methodology

UNIT-I	**6 Hrs**

The Multidisciplinary Nature of Environmental Studies: Definition, Scope and importance

Natural Resources: Forest Resources-Use and overexploitation of forests, Deforestation, Timber extraction, Mining, Dams and their effects on forests and tribal people**;** Water Resources-Use and over-utilization of surface and ground water, Floods, Drought, Conflicts over water**;** Mineral Resources-Environmental effects of extracting and using mineral resources**;** Energy Resources-Renewable and non-renewable energy sources, Use of alternate energy sources

Self Learning Topics (SLTs): *Use and over-utilization of surface and ground water(Text1: unit 2, topic: 2.2.2) world food problems(Text1: unit 2, topic 2.2.2)*

UNIT-II	**6 Hrs**

Ecosystem and Biodiversity:

Ecosystem: Concepts of an ecosystem, Food chain, Food webs, Ecological pyramids, Energy flow in the ecosystem and ecological succession

Biodiversity and its Conservation: Introduction, Definition, Genetic, Species and ecosystem diversity, Value of biodiversity, Biodiversity in India, Hot spots of biodiversity, Man-wildlife conflicts, Endangered and endemic species of India; In-situ and Ex-situ conservation

Self Learning Topics (SLTs): *Introduction and definition of biodiversity (Text1: unit 4, topic 4.1)*

UNIT-III	**6 Hrs**

Environmental Pollution: Global issues**-**Global climatic change, Greenhouse gases, Effects of global warming, Ozone layer depletion

International Conventions/Protocols: Earth summit, Kyoto protocol, Montreal protocol

Environmental Pollution-Causes and effects of air, Water, Soil, Marine and noise pollution with case studies

Solid and Hazardous Waste Management: Introduction, Types, Effects of urban industrial and nuclear waste

Natural Disaster Management: Introduction to disaster, Management of disaster, Disaster management of flood, earthquake, cyclone and landslides

Role of information technology in environment and human health

Self Learning Topics (SLTs): *Role of individual in prevention of pollution (Text1: unit 5, topic 5.10)*

UNIT-IV	6 Hrs

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

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

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

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

Course Learning Outcomes (COs):

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

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

Text Book(s):

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

Reference Book(s):

1. Y. Anjaneyulu, *Introduction to Environmental Science*, 1st ed., Hyderabad, India: B.S. Publications, 2004
2. G. M. Masters, *Introduction to Environmental Engineering & Science*, 3rd ed., New Delhi, India: Prentice Hall of India, 1991
3. A. Kaushik and C. P. Kaushik, *Environmental Studies*, 4th ed., New Delhi, India: New Age International Publishers, 2014
4. R. Rajagopalan, *Environmental Studies: From Crisis to Cure*, 2nd ed., New Delhi, India: Oxford University Press, 2011

Web and Video link(s):

1. https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/ *video lecture on renewable energy resources by Prof. Vaibhav. V. Goud and Dr. R. Ananda lakshmi, Dept. of Chemical Engineering, Guwahati.*

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

IDEA Lab Makerspace

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: carpentry and CNC wood router
LO2: mould for sand casting and arc welding joints
LO3: laser engraving, 3D printing and robots in manufacturing
LO4: Printed Circuit Board (PCB) and Internet of Things (IoT)

LABORATORY COMPONENT

S. No.	Creative Fabrication Technology	List of Experiments
1.	Carpentry	Prepare a half lap dovetail joint
2.	CNC Wood Router	Perform wood carving using CNC Wood Router
3.	Foundry	Prepare a sand mould using single piece pattern
4.	Welding	Prepare a single V-butt joint on mild steel plates using AC arc welding machine
5.	Injection Moulding	Prepare a plastic product using Injection moulding machine
6.	Laser Engraving	Perform key chain by using CO_2 laser cutting machine
7.	3D Printing	Prepare a key chain on 3D printer with the given dimensions
8.		Prepare a Spur Gear on 3D printer with the given dimensions
9.	Robotics	Perform basic pick-and-place operation using robot
10.	Printed Circuit Board (PCB)	Design and fabricate a PCB for a given application
11.	Internet of Things (IoT)	Measure the temperature and humidity by using DHT11 sensor and Arduino UNO
12.		Create a smart plant watering system using IoT
Course Project		• Students are required to create an affordable prototype as their course project, based on the knowledge and skills acquired during the course. • Students have to present and submit their prototypes to demonstrate their ability to apply classroom learning practically, showcasing their creativity and technical aptitude.

Laboratory Manual:

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

Text/ Reference Book(s):

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, Anandarupmukherjee and Arijit Roy, "*Introduction to IoT*", New Delhi: University Cambridge Press, 2021.

Course Learning Outcomes (COs):

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

(based on psychomotor skills acquired from laboratory component)

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

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

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

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

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

PRACTICUM

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps
LO2: implementing a project independently by applying knowledge to practice
LO3:preparingwell-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	U24PY202B	U24IT203	U24IT204	U24EE205B	U24CY206	U24MH201
Students allotted to different courses	B24IT001	B24IT012	B24IT023	B24IT034	B24IT045	B24IT056
	B24IT002	B24IT013	B24IT024	B24IT035	B24IT046	B24IT057
	B24IT003	B24IT014	B24IT025	B24IT036	B24IT047	B24IT058
	B24IT004	B24IT015	B24IT026	B24IT037	B24IT048	B24IT059
	B24IT005	B24IT016	B24IT027	B24IT038	B24IT049	B24IT060
	B24IT006	B24IT017	B24IT028	B24IT039	B24IT050	B24IT061
	B24IT007	B24IT018	B24IT029	B24IT040	B24IT051	B24IT062
	B24IT008	B24IT019	B24IT030	B24IT041	B24IT052	B24IT063
	B24IT009	B24IT020	B24IT031	B24IT042	B24IT053	B24IT064
	B24IT010	B24IT021	B24IT032	B24IT043	B24IT054	B24IT065
	B24IT011	B24IT022	B24IT033	B24IT044	B24IT055	

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

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(iv). ***To complete the practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the classwork timetable and outside the class work hours during weekdays.***

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

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

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

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

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

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

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

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

(i) **Working Model**: Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.

(j) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.
- What was the objective of the practicum assigned?
- What are the main responsibilities and tasks for practicum?
- What knowledge and skills from the coursework are applied in the practicum?
- What new knowledge and skills are acquired during the practicum?
- In what ways, can the practicum be helpful for the professional career?
- What gaps are identified in your practicum work?
- What improvements or changes you suggestfor addressing the identified gaps for future work?

(k) **Anti-Plagiarism Check:** The practicumreport should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(l) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the course teacheras per the schedule notified by the department

(m) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact

(n) The student has to register for the Practicum as a supplementary examination in the following cases:
- 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 anddefine 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 practicumand make an effective oral presentation using PPTs

Course Articulation Matrix (CAM):		**U24EL208 PRACTICUM**											
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	**U24EL208.1**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO2	**U24EL208.2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO3	**U24EL208.3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
CO4	**U24EL208.4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
U24EL208		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**

Course code U24ELXYY: ***X represents semester, YY represents ETA course serial number***

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA /SAA)			
Class: B.Tech. II Semesters	**Branch:** Common to all branches		
Course Code:	**U24VA210(SE/SA)ZZZ**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-0-2-2**	**CIE:**	**100%**
Total Number of Teaching Hours:	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: holistic development through activity-based learning to gain real-life experiencewhicheffectively help individualsdeal 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 presentationthrough PPTs portraying knowledge, skills,qualitiesacquired and social impact of the activity

Activity Based Liberal Learning about Life, Literature and Culture (ABLL@LLC) isintroduced 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 andsocial 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** (SelfAccomplishment Activities)

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

(a) Each SEA/SAA activity is treated as one credit course

(b) Student must select one activity per semester,through first 04 semesters, from the courses listed under SEA/ SAA, before commencement of the semester.

(c) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA

(d) To complete these activities student shall work outside the class work hours, during weekends, holidays, semester breaks, etc.,

(e) If a student is not able to attend/ fulfil performance requirements, he/she shall be dropped from the course and shall have to enrol in the forthcoming semesters.

Monitoring SEA/SAA:

(f) **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.

(g) During the semester period, the student has to**acquire requisite knowledge**, **conduct fieldwork**, acquire skills and propose unique solutions to the real-life problems

(h) **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.

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

i. This student-driven Fieldwork allow students to interact with the 'real world'. It is an autonomous learning (self-learning) situation that students are more actively involved during the activity and develop a deeper understanding and develop a more positive attitude.

ii. Fieldwork consists of three phases: preparation, the actual activity and feedback

iii. As part of fieldwork, student has to interact with at least two eminent personalities/achievers/renowned persons/inspiring and great personalities related to the activity chosen.

iv. Fieldwork will benefit students for any careers where they need to work with communities of people or which involves analysis of complex processes, especially social and cultural.

v. Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more

vi. Other skills important for fieldwork practice include the ability to act in a crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.

vii. **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/ Achievers / Renowned personalities:

(a). **In case of socially relevant problems/ activities of SEA/SAA: E**minent 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.

i. **For appointment to interacteminent personalities**: Student is expected to follow email etiquette rules and other appropriate polite communication etiquettes for getting appointment and time for interaction

ii. On fieldwork, student is expected to demonstrate solid time management, organisational and note taking skills during fieldwork

iii. **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

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

v. 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.

vi. 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.

vii. **Feedback:**The learnings the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.

- During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentationand report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.

(j) **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.

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

i. ***Faculty counsellor approval***: In week (-1), in consultation with faculty counsellor, every studentshall, identifiesminimum of4 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.

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

The CIE for SEA/SAA is as follows:

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

Note:

(m) **Presentation/ Demonstration:**It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule

notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.

(n) **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.*

(o) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute.

(p) **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

(q) **Supplementary examination:** If a student fails in SEA/SAA activity of a particular semester, he must complete the same by enrolling it in the next higher semesters.

Course Learning Outcomes (COs):

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

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

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

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

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

Text / Reference book(s):

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

Course Code: **U24VA XYY(SE/SA)ZZZ**

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

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

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

(a) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.

(b) Learning from industry experts with real-world examples,is important to enhance your educational experience.

(c) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximised if you are clear on the purpose of your developed competencies and how to apply them in a range of complex situations.

(d) Graduate employability could be enhanced through fostering lifelong learning, the development of a range of employability-related competencies and increased confidence and capacity in "reflecting on and articulating these capabilities and attributes in a range of recruitment situations".

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

(e) The answer is Industry**Expert Talk Series (ETS)**.Through ETS, we invite industry experts in different fields to deliver talks and interact with students.

(f) Through Industry expert talks students get to know so much more that textbooks don't explain.

(g) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.

(h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses

(i) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.

(j) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability**

enhancement category of courses.

(k) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.

(l) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.

(m) ETS enhances your learning in many ways for global opportunities for your career.

(n) All in all, learning from industry experts**,** is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.

(o) Salient features of ETS are hereunder:

(i) ETS is offered from I semester to VI semester.

(ii) ETS, in any given semester, is treated as one credit course

(iii) Students are required to earn six credits (from I to VI semester)

(iv) **Head, Centre for i²RE** shall be the **institute level ETS coordinator**

(v) Under this course, a minimum of 10 expert talks shall be organized in **online/offline mode**by the parent department / Centre for i²RE.

(vi) Each expert talk shall be for a minimum duration of 45 minutes (*but not exceeding 90 minutes*) followed by **online quiz/test** for 10 marks(10 MCQs/FiBs;*duration: 10-15 mins*), on the contents covered in the expert talk.

(vii) **The Head C-i²RE** shall share the marks obtained by the students in each of the quizzes / tests to the respective **department ETS coordinators.**

(viii) Each student shall attend a minimum of 6 expert talks and attempt the corresponding quizzes/ tests conducted at the end of the talks.

(ix) **Report on ETS:**At the end of semester, the student shall submit a well-documented report on the acquired knowledge and skills, in the prescribed format, to the department ETS coordinator.

(x) **Evaluation:**There shall be only continuous Internal Evaluation (CIE) for ETS for a maximum of 100 marks

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

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

iii. Supplementary Exam:

(e) Student has to register for ETS supplementary examination if he/she scores less than 40 marksin CIE

(f) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks(MCQs/FiBs ; *duration: 2Hrs*)on the content covered in ETS lectures.

(g) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE

(h) Exam material/resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

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

CO1: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO2: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

CO3: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO4: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		**U24AE211** EXPERT TALK SERIES											
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	U24AE211.1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE211.2	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE211.3	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE211.4	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE211		**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

Course code U24AEXYY: ***X represents semester, YY represents ETA course serial number***

1st Year Exit Courses Syllabi

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 IT)

(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 IT: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT212X	PC Software	2	-	2	-	4	3
2	PCC	U24IT213X	Digital Marketing	2	-	2	-	4	3
3	PCC	U24IT214X	Web Designing	2	-	2	-	4	3
4	PCC	U24IT215X	Hardware and Networking	2	-	2	-	4	3
5	PCC	U24IT216X	Any other course approved by BoS Chair andDean AA						

(OR)

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

Exit Option to Qualify UG Certificate in IT: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212X	UNIX/LINUX Programming https://www.udemy.com/course/complete-linux-training-course-to-get-your-dream-it-job/?couponCode=ST3MT72524	-	-	6	-	6	3
2	SEC	U24SE213X	Java Programming https://learn.oracle.com/ols/learning-path/java-fundamentals/55593/55578	-	-	6	-	6	3
3	SEC	U24SE214X	Advanced Data Structures https://www.udemy.com/course/data-structures-and-algorithms-deep-dive-using-java/?couponCode=ST3MT72524	-	-	6	-	6	3
4	SEC	U24SE215X	SQL and PL/SQL Programming https://www.udemy.com/course/the-ultimate-mysql-bootcamp-go-from-sql-beginner-to-expert/?couponCode=ST3MT72524	-	-	6	-	6	3
5	SEC	U24SE216X	Any other skill based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

PC SOFTWARE

Class: B.Tech. II –Semester (Exit)			**Branch:** IT		
Course Code	**:**	**U24IT212X**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE**	**:**	**60%**
Total Number of Teaching Hours	**:**	**16 Hrs**	**ESE**	**:**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: document, paragraph formatting, formatting sections, tables and mail merge

LO2: excel worksheet, formulas, functions and if functions

LO3: storing and managing databases in excel and creating charts in excel

LO4: formatting a presentation, adding movement and sound to a presentation

THEORY COMPONENT

UNIT-I	**4 Hrs**

Getting to Know Office: Start and exit an application, Ribbon, File menu operations

Creating a Word Document: Start a new document, Choose between manual and style-based text formatting, Change the text font, Size, Apply text-color, effects, formatting, Check spelling and grammar, Email a document to others, Save document in various formats, Print your work

Paragraph Formatting: Adjust paragraph spacing, Border, Background, Creating bullets and numbers lists, Apply styles, Modify styles

Formatting Sections, Pages, and Documents: Set-margins, Page size and orientation, Multicolumn document

Working with Tables and Graphics in Word

Reference and Mail Merges in Word

UNIT-II	**4 Hrs**

Creating Basic Excel Worksheets: Understanding the excel interface, Move between cells, Select cells and ranges, Enter and edit text in cells, Use autofill to fill cell content, Copy and move data between cells, Insert and delete rows, columns, and cells, Create and manage multiple worksheets

Creating Excel Formulas and Functions: Write basic formulas, Copy and move formulas, Insert functions, Show the current date or time with a function, Calculate loan terms, Perform math calculations, Evaluate a condition with an *if* function, Formatting and printing excel worksheet

UNIT-III	**4 Hrs**

Storing and Managing Databases in Excel: Create an excel database, Sort a table, Filter a table, Add a total row to a table, Create queries, Remove duplicates from a dataset, Restrict data entry with validation rules

Creating Charts in Excel: Choose the correct chart type, Create a chart, Move and resize a chart, Switch rows and columns, Modify the data range for a chart, Change the axis scale of a chart, Apply a chart style, Change a chart's color, Add or remove chart elements, Format a chart element

UNIT-IV	**4 Hrs**

Formatting a Presentation: Understanding templates versus themes, Change the theme, Change the presentation colors and fonts, Modify the theme in slide master view, Enable footer

placeholders, Format text boxes and placeholders, Create smart art graphics, Modify the structure of a smart art graphic, Format a smart art graphic

Adding Movement and Sound to a Presentation: Add slide transition effects, Set slides to advance manually or automatically, Animate objects, Insert a sound clip, Insert a video clip on a slide

Presenting a Slide Show: Display a slide show onscreen, Annotate slides with the pen tools, Use Presenter view, Print handouts, Export handouts to word

LABORATORY COMPONENT

List of Experiments

1. Create a word document about the importance of ms-office tools in the daily life, by applying various word formatting tools - font, size, text color, specific formatting styles
2. Create a document and apply various paragraph features like specified spacing, border, background, and bullet or number list style
3. Create a table and apply all the features related to the tables, split, merge, insert, insert an image to the cell
4. Scenario: You are an administrator at a school and have been tasked with notifying parents about their child's attendance shortage. You have a list of 20 students who have not met the minimum attendance requirements. Prepare a mail merge document with suitable fields and text
5. Describe the process of moving between cells in an Excel worksheet using both mouse and keyboard methods. How would you select a range of cells that are not adjacent to each other
6. Describe how to use the AutoFill feature to populate a series of dates in a column. Additionally, detail the steps required to copy data from one cell to another non-adjacent cell, and describe how to insert a new row between existing rows in a worksheet
7. Loan Term Evaluation Using IF Condition-You have a spreadsheet with loan amounts listed in column A. You need to determine the loan term based on the amount borrowed and calculate the monthly payment for each loan. The loan terms are as follows:
   If the loan amount is less than 50,000, the term is 5 years
   If the loan amount is between 50,000 and 100,000, the term is 10 years
   If the loan amount is more than 100,000, the term is 15 years
8. Create an excel database of customer transactions, apply various filter to sort the database. How would you sort the table to display the most recent transactions first, filter the table to show only transactions above 50000 rupees, and then remove any duplicate entries
9. After analyzing sales data, you decide to create a chart in excel to present the information. Which chart type would be most appropriate for showing monthly sales trends, and how would you customize the chart's colors and format the axis scale to reflect thousands of rupees
10. Using the PowerPoint interface, create a presentation on 'The Evolution of Renewable Energy'. Start by selecting an appropriate theme and customizing it with your preferred colors and fonts in the Slide Master view. Ensure you include a variety of slide layouts. Populate your slides with relevant content, including text, graphics, and images. Add transitions between slides, animate key objects, and insert audio clips to enhance your points. Finally, prepare the presentation for delivery by setting up the slides to advance manually. How would you structure your presentation to maintain a logical flow and engage your audience effectively

Text Book:

1. F. Wempen, *Microsoft Office 2016 At Work for Dummies*, 1st ed., New York, USA: John Wiley & Sons, Inc., 2016

Reference Book(S):

1. S. Goel, *PC Software*, 1st ed., Delhi, India: Nat Raj Publishing House
2. A. Leon and M. Leon, *Introduction to Computers with MS-Office 2000*, 2001
3. L. Bali, *Microsoft Office 2016: Word, Excel, OneNote Book*, 1st ed., Delhi, India: Notion Press, 2021

Web and Video link(s):

1. **https://www.youtube.com/playlist?list=PLLy_2iUCG87CUBbhq5BEAiC--fF6lEOe1**
   NPTEL Video Lectures on Decision Making with Spreadsheet, by Prof. Ramesh Abanandam, IIT Roorkee

Laboratory Manual (for laboratory component):

1. *PC Software Laboratory Manual and Record Book,* Department of IT, KITSW

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: design word documents with rich text formatting features

CO2: apply excel mathematical function in various calculations

CO3: design database & apply sorting filters to the data tables and create various charts to for the given data

CO4: create good presentation using various text animations , sound effects and videos

(based on psychomotor skills acquired from laboratory component)

CO5 : implement documents using office formatting tools

CO6 : solve various numerical problems using excel functions

CO7 : create tables in excel and apply various filtering mechanisms to sort the tables

CO8 : design and create presentations using video and audio tools

Course Articulation Matrix (CAM):		U24IT212X PC SOFTWARE												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24IT212X.1	2	2	2	2	-	-	1	-	1	-	1	2	2
CO2	U24IT212X.2	2	2	2	2	-	-	1	-	1	-	1	2	2
CO3	U24IT212X.3	2	2	2	2	-	-	1	-	1	-	1	2	2
CO4	U24IT212X.4	2	2	2	2	-	-	1	-	1	-	1	2	2
CO5	U24IT212X.5	1	1	2	1	-	-	1	1	1	-	1	2	2
CO6	U24IT212X.6	1	1	2	2	-	-	1	1	1	-	1	2	2
CO7	U24IT212X.7	1	1	2	3	-	-	1	1	1	-	1	1	1
CO8	U24IT212X.8	1	1	2	3	-	-	1	1	1	-	1	1	1
U24IT214X		1.5	1.5	2	2.12	-	-	1	1	1	-	1	1.75	1.75

DIGITAL MARKETING

Class: B.Tech. II –Semester (Exit)			**Branch:** IT	
Course Code	**:**	**U24IT213X**	**Credits :**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE :**	**60 %**
Total Number of Teaching Hours :		**32 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

- **LO1:** fundamentals of digital marketing, marketing strategy and marketing communications
- **LO2:** micro-environment-situation analysis for digital marketing
- **LO3:** online macro-environment
- **LO4:** digital marketing strategy and situation analysis

THEORY COMPONENT

UNIT-I	**4 Hrs**

Introducing Digital Marketing: Introduction – How have digital technologies transformed marketing,Definitions – What are digital marketing and multichannel marketing, Introduction to digital marketing strategy,Introduction to digital marketing communications

UNIT-II	**4 Hrs**

Online Marketplace Analysis: Micro-environment-situation analysis for digital marketing,Digital marketing environment,Understanding customer journeys,Consumer choice and digital influence,Online consumer behaviour and implications for marketing,Competitors,Suppliers,New channel structures,Business models for e-commerce

UNIT-III	**4 Hrs**

The Online Macro-Environment: The rate of environment change,Technological forces,Economic forces,Political forces,Legal forces,Social force,Cultural force

UNIT-IV	**4 Hrs**

Digital marketing strategy:The need for an integrated digital marketing strategy,How to structure a digital marketing strategy,Situation analysis,Setting goals and objectives for digital marketing,Strategy formulation for digital marketing,Strategy implementation**.**

LABORATORY COMPONENT

List of Experiments-Case studies

1. Case Study on eBay thrives in the global marketplace
2. Case Study on boo hoo – learning from the largest european dot-com failure
3. Case Study on Zopa launches a new lending model
4. Case Study on Tesco online development strategy supports global expansion

Textbook(s):

1. D. Chaffey and F. Ellis-Chadwick, *Digital Marketing: Strategy, Implementation and Practice*, 6th ed., Harlow, England: Pearson, 2016

Reference Book(s):

1. A. Charlesworth, *Digital Marketing: A Practical Approach*, 3rd ed., London, UK: Routledge, 2018
2. P. Kotler, H. Kartajaya, and I. Setiawan, *Marketing 4.0: Moving from Traditional to Digital*, 1st ed., Hoboken, NJ: Wiley, 2017
3. D. Ryan, *Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation*, 3rd ed., London, UK: Kogan Page Limited, 2014

Web and Video link(s):

1. Digital Marketing - Course (swayam2.ac.in); *NPTEL Video Lecture on Digital Marketing by Digital Marketing*

Laboratory Manual (for laboratory component):

1. *Digital Marketing Laboratory Manual and Record Book,* Department of IT, 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: illustratethe different types of digital platforms and digital media to marketing, evaluate the advantages and challenges of digital media and identify the key differences between customer communications digital marketing and traditional marketing

CO2: identify the elements of an organisation's online marketplace, evaluate techniques for reviewing the importance of different actors in the micro environment, review changes to business and revenue models enabled by digital market

CO3: identify how the macro-environment affects an organisation's digital marketing strategy, planning, implementation and performancethat able to relate business strategy

CO4: Identify opportunities and threats arising from digital media and technology platforms and Evaluate alternative strategic approaches for using digital platforms

(based on psychomotor skills acquired from laboratory component)

CO5: develop a case study on how eBay successfully thrives in the global marketplace

CO6: identify Boo.com – insights from the largest European dot-com failure

CO7: develop a case study on Zopa's launch of a new lending model

CO8: analyze how Tesco's online development strategy supports its global expansion.

Course Articulation Matrix (CAM):		**U24IT213X DIGITAL MARKETING**												
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	**U24IT213X.1**	2	1	-	-	-	-	1	-	-	-	1	2	2
CO2	**U24IT213X.2**	2	2	2	1	-		1	-	-	-	1	2	2
CO3	**U24IT213X.3**	2	2	2	2	1		1	-	-	-	1	2	2
CO4	**U24IT213X.4**	2	2	2	2	1		1	-	-	-	1	2	2
CO5	**U24IT213X.5**	2	1	-	-	-		1	1	1	-	1	2	2
CO6	**U24IT213X.6**	2	2	2	1	-		1	1	1	-	1	2	2
CO7	**U24IT213X.7**	2	2	2	2	1		1	1	1	-	1	2	2
CO8	**U24IT213X.8**	2	2	2	2	1		1	1	1	-	1	2	2
U24IT213X		**2**	**2**	**1.75**	**2**	**1.66**		**1**	**1**	**1**	**-**	**1**	**2**	**2**

WEB DESIGNING

Class: B.Tech. II –Semester (Exit)			**Branch:** IT	
Course Code	**:**	**U24IT214X**	**Credits** **:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE** **:**	**60 %**
Total Number of Teaching Hours	**:**	**32 Hrs**	**ESE** **:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

- **LO1:** HTML elements to create accessible and user-friendly pages, incorporate images, links, tables, forms, and media into web content
- **LO2:** complex layouts using CSS shapes and text wrapping and utilize relative, absolute, and fixed positioning for precise control
- **LO3:** the basic structure of JavaScript and learn how to embed it into an HTML page and understand the Document Object Model (DOM) and its manipulation
- **LO4:** optimal image size and resolution for various devices and screen sizes, convert images into web-friendly formats while preserving quality on HTML page

THEORY COMPONENT

UNIT-I — 4 Hrs

Creating a Simple Page: A web page step-by-step, Launch a text editor, Step 1: start with content, Step 2: give the HTML document structure, Step 3: identify text elements, Step 4: add an image, Step 5: change the look with a style sheet, When good pages go bad, Validating your documents

Marking Up Text: Paragraphs, Headings, Thematic breaks (horizontal rule), Lists, More content elements, Organizing page content, The inline element roundup, Generic elements (div and span), Improving accessibility with ARIA, Character escapes

Adding Links: The href attribute, Linking to pages on the web, Linking within your own site, Targeting a new browser window, Mail links, Telephone links

Adding Images: First, a word on image formats, The img element, Adding SVG images, Responsive image markup

Table Markup: How to use tables, Minimal table structure, Table headers, Spanning cells, Table accessibility, Row and column groups, Wrapping up tables

Forms: How forms work, The form element, Variables and content, The great form control roundup, Form accessibility features, Form layout and design

Embedded Media: Window-In-A-Window (iframe), Multipurpose Embedder (object), Video and Audio, Canvas

UNIT-II — 4 Hrs

Introducing Cascading Style Sheets: The benefits of CSS, How Style Sheets Work, The big concepts, CSS units of measurement, Developer tools right in your browser, Moving forward with CSS

Formatting Text: Basic Font Properties, Advanced Typography with CSS3, Changing Text Color, A few more selector types, Text line adjustments, Underlines and other "decorations", Changing capitalization, Spaced out, Text shadow, Changing List Bullets and Numbers

Colors and Backgrounds: Specifying color values, Foreground color, Background color, Clipping the background, Playing with opacity, Pseudo-class selectors, Pseudo-element selectors, Attribute selectors, Background images, The shorthand background property, Like a rainbow (gradients), Finally, external style sheets

Thinking Inside the Box: The element box, Specifying box dimensions, Padding, Borders, Margins, Assigning display types, Box drop shadows

Floating and Positioning: Normal flow, Floating, Fancy text wrap with CSS shapes, Positioning basics, Relative positioning, Absolute positioning, Fixed positioning

CSS Layout with Flexbox and Grid: Flexible boxes with CSS flexbox, CSS grid layout

Responsive Web Design: Why RWD?, The responsive recipe, Choosing breakpoints, Designing responsively, A few words about testing, More RWD resources
Transitions, Transforms, and Animation: Ease-y does it (CSS transitions), CSS transforms, Keyframe animation
More CSS Techniques: Styling forms, Styling tables, A clean slate (reset and normalize.css), Image replacement techniques, CSS sprites, CSS feature detection, Wrapping up style sheets
Modern Web Development Tools: Getting cozy with the command line, CSS power tools (processors), Build tools (grunt and gulp), Version control with Git and GitHub

UNIT-III	**4 Hrs**

Introduction to JavaScript: What Is JavaScript?Adding JavaScript to a page, The anatomy of a script, The browser object, Events
Using JavaScript: Meet the DOM, Polyfills, JavaScript libraries, Big finish

UNIT-IV	**4 Hrs**

Web Image Basics: Image sources, Meet the formats, Image size and resolution, Image asset strategy, Favicons
Image Asset Production: Saving images in web formats, Working with transparency, Responsive image production tips, Image optimization
SVG: Drawing with XML, Features of SVG as XML, SVG tools, SVG production tips, Responsive SVGs, Further SVG exploration

LABORATORY COMPONENT

List of Experiments

1. Design a home page that displays information about your college departments using headings, HTML entities, and paragraphs
2. Design a timetable and display it in tabular format.
3. Design an admission form for any course in your college with text, password fields, drop-down list, check-boxes, radio buttons, submit and reset button etc.
4. Create a website for online book store with Home, Login, Catalogue, Registration page with links to all these pages in a menu on top of every page. Embed heading, paragraph, images, video, iframe, form controls, table, list in this website.
5. Design a web page of your home town with an attractive background color, text color, an image, font face by using Inline CSS formatting.
6. Write a JavaScript program to remove a character at the specified position of a given string and return the new string.
7. Write a JavaScript program to compute the sum of elements of a given array of integers.
8. Develop and demonstrate a HTML file that includes JavaScript script for taking a number n as input using prompt and display first n Fibonacci numbers in a paragraph.
9. Develop and demonstrate a HTML file that includes JavaScript script for taking full name in a text field and display first, middle, last name in 3 different labels. Middle and last name may be optional, thus message like "NA" should be displayed in corresponding labels. If the input contains 2 words, then they should be considered as first and last names.
10. Develop and demonstrate a HTML file that includes JavaScript script for switching an image source for a image on click of "change" and "original" button.
11. Design HTML form for keeping student record, apply JavaScript validation in it for restriction of mandatory fields, numeric field, email-address field, specific value in a field etc.
12. Write a JavaScript code that displays text "Bigger Text" with increasing font size in the interval of 10ms in red color, when the font size reaches 50pt it displays "Smaller Text" in green color. Then the font size should decrease to 5pt and then stop.

Text Book:

1. J. N. Robbins, *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics*, 5th ed., Sebastopol, CA: O'Reilly Media, 2018

Reference Book(s):

1. U. K. Roy, *Web Technologies*, 1st ed., New Delhi, India: Oxford University Press, 2016
2. Kogent Learning Solutions Inc., *Web Technologies: HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML*, 1st ed., New Delhi, India: Dreamtech Press, 2013

Web and Video link(s):

https://onlinecourses.swayam2.ac.in/nou24_cs12/preview;*NPTEL Video Lecture on CIT-003: Web Based Technologies and Multimedia Applications by Prof.P. V. Suresh, Indira Gandhi National Open University*

Laboratory Manual (for laboratory component):

1. *Web Designing Laboratory Manual and Record Book,* Department of IT, 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: construct HTML documents from scratch, incorporating text, images, links, tables, forms, and embedded media

CO2: utilize CSS to control the layout, appearance, and behavior of HTML elements

CO3: utilize JavaScript libraries and frameworks and apply tools to enhance developmentand create complex applications

CO4: implement image best practices to integrate images effectively into web pages, considering factors like accessibility and SEO

(based on psychomotor skills acquired from laboratory component)

CO5: create functional and informative web pages, design effective layouts, and implement interactive forms

CO6: apply CSS styling to modify the appearance of text, background, and images on a web page

CO7: understand JavaScript fundamentals and grasp the core concepts, syntax, and structure of JavaScript programming

CO8: create scalable and interactive graphics for web applications and integrate images into web pages

HARDWARE AND NETWORKING

Class: B.Tech. II –Semester (Exit)			**Branch:** IT	
Course Code	**:**	**U24IT215X**	**Credits** **:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE** **:**	**60 %**
Total Number of Teaching Hours	**:**	**32 Hrs**	**ESE** **:**	**40 %**

Course Learning Objectives (LOs) :

This course will develop students' knowledge in /on…

- **LO1:** computer hardware and maintenance
- **LO2:** PC assembling and troubleshooting
- **LO3:** networking fundamentals, network devices and protocols, network security and wireless networking
- **LO4:** internet and network architecture, network management and troubleshooting

THEORY COMPONENT

UNIT-I	**4 Hrs**

Computer Hardware and Maintenance: Study of maintenance kit, Computer peripheral, Reassembling computer system, Disk drive performance, File system, Unlock USB port, Speaker, Web camera.

UNIT-II	**4 Hrs**

PC Assembling and Troubleshooting: Troubleshooting & repairing of motherboard & components on motherboard, Software & Hardware troubleshooting, Use basic hand tools effectively, Able to perform basic troubleshoots of PC, Able to install & maintain software for PC.

UNIT-III	**4 Hrs**

Networking Fundamentals: Introduction to networking, Network Fundamentals :TCP/IP, HTTP, FTP, Network Topologies: LAN, WAN, MAN

Network Devices and Protocols: Network Devices: Router, Switch, Hub**,** Network Protocols: DHCP, DNS, NAT

Network Security and Wireless Networking: Network security :Firewall, VPN, Encryption**,** Wireless networking :Wi-Fi, Bluetooth

UNIT-IV	**4 Hrs**

Internet and Network Architecture: Internet concepts : ISP, Domain name, Web hosting**;** Network architecture : Client-Server, Peer-to-Peer

Network Management and Troubleshooting: Network management**,** Network troubleshooting

LABORATORY COMPONENT

List of Experiments

Hardware:

1. Assembling a PC: Assemble a PC from scratch and install the operating system.
2. BIOS Settings and Configuration: Explore and configure BIOS settings (boot order, time, date).
3. Expansion Card Installation: Install and test expansion cards (graphics, sound, network).
4. Hard Drive Installation and Partitioning: Install and partition a hard drive.

5. Printer and Scanner Installation: Install and test printers and scanners.
6. Mobile Device Hardware Troubleshooting: Troubleshoot common mobile device hardware issues (display, battery, charging).

Networking:

7. Configuring a Switch: Configure and test a switch (VLAN, trunking, spanning tree).
8. Implementing a Firewall: Implement and test a firewall (rule-based, NAT, port forwarding).
9. Setting up a Wireless Access Point: Configure and test a wireless access point (SSID, WPA2, MAC filtering).
10. Network Monitoring and Troubleshooting: Use tools like Nagios or Wireshark to monitor and troubleshoot a network.
11. Implementing a VPN: Set up and test a virtual private network (VPN).
12. Configuring a Router: Configure and test a router (static routing, RIP, OSPF).

Text Book(s):

1. V. Gupta, *Comdex Information Technology Course Tool Kit*, 1st ed.,New Delhi, India: WILEY Dreamtech, 2005

Reference Book(s):

1. C. A. Schmidt, *The Complete Computer Upgrade and Repair Book*, 3rd ed., New Delhi, India: Dreamtech Press, 2002
2. ITL Education Solutions, *Introduction to Information Technology*, 2nd ed., New Delhi, India: Pearson Education, 2012.
3. K. J. Chase, *PC Hardware - A Handbook*, New Delhi, India: PHI (Microsoft), 2004.
4. F. Mittelbach and M. Goossens, *The LaTeX Companion*, 2nd ed., Boston, MA: Addison-Wesley, 2013.
5. D. Anfinson and K. Quamme, *IT Essentials: PC Hardware and Software Companion Guide*, 3rd ed., Indianapolis, IN: CISCO Press, 2018.
6. P. Regan, *IT Essentials: PC Hardware and Software Labs and Study Guide*, 3rd ed., Indianapolis, IN: CISCO Press, 2018

Web and Video link(s):

1. https://www.udemy.com/course/computer-hardware-operating-system-and-networking-r/?utm_source=adwords&utm_medium=udemyads&utm_campaign=Search_DSA_Beta_Prof_la.EN_cc.India&campaigntype=Search&portfolio=India&language=EN&product=Course&test=&audience=DSA&topic=&priority=Beta&utm_content=deal4584&utm_term=_.ag_160270535665_.ad_696202838337_.kw__.de_c_.dm__.pl__.ti_dsa-1677053911888_.li_9301462_.pd__.&matchtype=&gad_source=1&gclid=Cj0KCQjwtsy1BhD7ARIsAHOi4xausSWGyKwWZyTCmMEE4qnMTv5bAtDDA9f05yIlbPP4pHRmeK1MpasaAslGEALw_wcB&couponCode=IND21PM

Laboratory Manual (for laboratory component):

1. *Hardware and Networking Laboratory Manual and Record Book,* Department of IT, KITSW
2.

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: make use of computer hardware for effective maintenance of peripherals
CO2: apply troubleshooting techniques in real time problems
CO3: illustrate the types of networks, protocol models to configure the network
CO4: analyze network architecture and troubleshooting for managing the network

(based on psychomotor skills acquired from laboratory component)

CO5: test for assembled PC and inspect the installed operating system working condition
CO6: experiment with mobile hardware
CO7: test for switches and routers working condition
CO8: analyze network protocols and ensure the network security

Course Articulation Matrix (CAM):		**U24IT215X - HARDWARE NETWORKING**												
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	**U24IT215X.1**	2	1	-	-	-	-	1	-	1	-	1	1	1
CO2	**U24IT215X.2**	2	2	1	-	-	-	1	-	1	-	1	1	1
CO3	**U24IT215X.3**	2	2	1	-	-	-	1	-	1	-	1	1	1
CO4	**U24IT215X.4**	2	2	1	-	-	-	1	-	1	-	1	1	1
CO5	**U24IT215X.5**	2	1	-	-	-	-	1	1	1	-	1	1	1
CO6	**U24IT215X.6**	2	2	1	-	-	-	1	1	1	-	1	1	1
CO7	**U24IT215X.7**	2	2	1	-	-	-	1	1	1	-	1	1	1
CO8	**U24IT215X.8**	2	2	1	-	-	-	1	1	1	-	1	1	1
U24IT215X		**2**	**1.75**	**1**	**-**	**-**	**-**	**-**	1	**1**	**-**	**1**	**1**	**1**

3rd Semester Syllabi

B. Tech (IT) –CURRICULUM & SYLLABUS (KITSW-URR24)

Abbreviations

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

III SEMESTER

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	ESC	U24IT301	Artificial Intelligence	2	1	-	4	7	3
2	PCC	U24IT302	Advanced Data Structures	2	1	2	5	10	4
3	PCC	U24IT303	Software Engineering	2	1	-	4	7	3
4	PCC	U24IT304	Database Management Systems	2	1	2	5	10	4
5	PCC	U24IT305	Object Oriented Programming through Java	2	1	2	5	10	4
6	VAC	U24VA306B	Soft and Interpersonal Skills Laboratory	-	-	2	2	4	1
7	SEC	U24SE307	Programming Skill Development Lab - 2	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309 XXXXX	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
			Total:	10	5	10	34	59	23
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

ARTIFICIAL INTELLIGENCE

Class: B.Tech. III -Semester			**Branch**	**:**	IT
Course Code	**:**	**U24IT301**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-1-0-4-7**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:**	**36 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: artificial intelligence and different heuristic search techniques used in AI problem solving

LO2: knowledge representation issues, predicate logic and representing knowledge using rules

LO3: slot and filler structures, game playing and expert systems technology

LO4: statistical reasoning methods, non-monotonic reasoning techniques and natural language processing

THEORY COMPONENT

UNIT-I	9 Hrs

Introduction to Artificial Intelligence: The AI problem domains, The underlying assumption, An AI technique, The level of the model, Criteria for success

Problems, Problem Spaces and Search: Defining the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs

Heuristic Search Techniques: Generate-and-Test, Hill climbing, Best-first-search, Problem reduction, Constraint satisfaction, Means-Ends Analysis

Real world applications: Puzzle solving and game playing

Self Learning Topics (SLTs): *State space search problems (Text1: topic 2.1), Practice problems (Text1: prob 2.6)*

UNIT-II	9 Hrs

Knowledge Representation Issues: Knowledge representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem

Using Predicate Logic: Representing simple facts in logic, Representing instance and is-a relationships, Computable functions and predicates, Resolution, Natural deduction

Representing Knowledge Using Rules: Procedural versus declarative knowledge, Forward versus backward reasoning

Real world applications: Fraud detection in financial transactions

Self Learning Topics (SLTs): *Introduction to knowledge representation (Text1: topic 4.1)*

UNIT-III	9 Hrs

Weak Slot and Filler Structures: Semantic nets, Frames

Strong Slot and Filler Structures: Conceptual dependencies, Scripts, CYC

Game Playing: The Min-Max search procedure, Adding alpha-beta cutoffs, Iterative deepening

Strong Method Problem Solving: Overview of expert system technology, Rule-based expert systems

Real world applications: Develop the script for going to a restaurant or a movie

Self Learning Topics (SLTs): *Introduction to game playing (Text1: topic 12.1)*

UNIT-IV	9 Hrs

Reasoning in Uncertain Situations: Introduction to non-monotonic reasoning, Logic-based abductive inference, Abduction - Alternative to logic
Understanding Natural Language: Role of knowledge in language understanding**,** Deconstructing language: A symbolic analysis, Syntax, Syntax and knowledge with ATN parsers
Statistical Reasoning: Bayesian networks, Dempster - shafer theory
Real world applications: Sentiment analysis and language translation systems

Self Learning Topics (SLTs): *Natural language applications (Text2: topic 14.1), Fuzzy logic (Text2: topic 8)*

Textbook(s):

1. Elaine Rich, Kevin Knight and Shivashankar B Nair, *Artificial Intelligence*, 3rd ed., New Delhi: Tata McGraw-Hill, 2012 (Chapters: 1 to 6, 8 to 10 & 12)
2. George F Luger, *Artificial Intelligence*, 4th ed., London: Pearson Education Asia, 2003 (Chapters 8, 9 & 15)

Reference Book(s):

1. Stuart Russell and Peter Norvig, *Artificial Intelligence* (*A Modern Approach*), 3rd ed., USA: Pearson Education, 2002
2. Eugene Charniak and Drew Mc Dermott, *Introduction to Artificial Intelligence*, 3rd ed., Noida: Pearson Education, 2000
3. S.S. Vinod Chandra, S. Anand Hareendran, *Artificial Intelligence and Machine Learning*, 1st ed., New Delhi: PHI Learning Pvt Ltd, 2014

Web and Video link(s):

1. *https://nptel.ac.in/courses/108/105/108105112//; NPTEL Video Lecture on Artificial Intelligence by Prof. Sudeshna Sarkar, Professor of CSED, IITK Kharagpur.*
2. *https://nptel.ac.in/courses/106102220//; NPTEL Video Lecture on Artificial Intelligence by Prof. Mausam, Professor of CSED, IIT Delhi.*
3. *https://nptel.ac.in/courses/106106226//; NPTEL Video Lecture on Artificial Intelligence by Prof. Deepak Khemani, Professor of CSED, IIT Madras.*
4. *http://kcl.digimat.in/nptel/courses/video/106105077/L27.html; NPTEL Video Lecture on Artificial Intelligence by Prof. D.Anuupam Basu, Professor of CSED, IITK Kharagpur.*

Course Learning Outcomes (COs)

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

CO1: **analyze** various AI problem domains, search strategies, and heuristic techniques to **evaluate** their effectiveness in solving complex real-world problems

CO2: build the knowledge representation system using predicate logic for the given problem domain and apply the reasoning techniques to infer new knowledge

CO3: **analyze** game-playing strategies and expert system architectures by examining search optimization methods and rule-based inference mechanisms for effective problem-solving

CO4: **apply** probabilistic and symbolic reasoning frameworks such as Bayesian networks, abduction, and ATN parsers to assess their effectiveness in handling uncertainty and language comprehension in AI systems

Course Articulation Matrix (CAM):		U24IT301 ARTIFICIAL INTELLIGENCE												
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	**U24IT301.1**	2	1	1	1	-	-	-	-	-	-	1	2	1
CO2	**U24IT301.2**	1	1	2	1	-	-	1	1	-	-	1	2	1
CO3	**U24IT301.3**	1	2	1	1	-	-	-	1	1	1	1	2	2
CO4	**U24IT301.4**	2	2	2	2	-	-	1	-	-	-	1	2	2
U24IT301		**1.5**	**1.5**	**1.5**	**1.25**	**-**	**-**	**1**	**1**	**1**	**1**	**1**	**2**	**1.5**

ADVANCED DATA STRUCTURES

Class: B.Tech. III–Semester			**Branch**	:	IT
Course Code	:	**U24IT302**	**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: sorting, searching, trees and binary tree

LO2: binary search tree, threaded binary tree, height balanced trees and red black tree

LO3: heap tree, trie tree indexing, multi-way search tree, graphs

LO4: applications of graph data structure, string matching algorithms

THEORY COMPONENT

UNIT-I — 9 Hrs

Sorting: Quick sort, Merge sort, Bitonic generator sort

Searching: Fibonacci search, Interpolation search, Time complexities of searching and sorting techniques

Trees: Basic terminologies, Types of trees

Binary Tree: Representation of binary tree, Operations on binary tree-insertion, deletion, recursive and non recursive traversal

Real world applications: File system structures, Database indexing

Self Learning Topics (SLTs): *Formation of binary tree from its traversals (Text1: topic 7.4.3.2), Practice problems (Text1: Prob 7.5, Reference1: Prob 9.11, Prob 9.12, Prob 9.13)*

UNIT-II — 9 Hrs

Binary Search Tree: Operations- insertion, deletion, searching, traversals

Threaded Binary Trees: Representation of threaded binary trees, Advantages

Height Balanced Binary Tree: AVL rotations, Insertion operation

Red-Black Trees: Properties, Operations on a red black tree-insertion

Real world Applications: Routing table lookups, Memory management in operating system

Self Learning Topics (SLTs): *Splay trees (Text1: topic 7.5.7), Interval tree (https://www.dgp.toronto.edu/public_user/JamesStewart/378notes/22intervals/), Hash tree (https://stackoverflow.com/questions/36590599/reading-a-3-candidate-hash-tree-structure), Solved problems (Text1: Prob 7.79), Practice problems (Text1: Prob 7.17, Prob 7.19, Reference1: Prob 10.18, 10.19)*

UNIT-III — 9 Hrs

Heap Tree: Representation of heap, Operations on a heap tree- insertion, deletion, Heap sort

Trie Tree Indexing: Trie structure, Operations on tries- searching, inserting, deleting

Multiway Search Trees: Introduction to m-way search trees. B-Tree indexing, Operations on B-Trees- searching, inserting, B+-trees indexing, searching, inserting

Graphs: Introduction, Graph terminology, Representation of graphs, Graph traversal methods-depth first search, breadth first search

Real world applications: Priority queues, Task scheduling, Multilevel indexing

Self Learning Topics (SLTs):*Priority queue (Reference1: topic 8.4.3), B-Tree vs. B+-Tree (Text1: topic 7.8), Solved problems (Text1: Prob 8.1), Practice problems (Reference1: Prob 11.10, Prob 13.7, Prob 13.8. Prob 13.9)*

UNIT-IV	**9 Hrs**

Application of Graph Structures: Topological sorting, Minimum spanning trees- Kruskal's algorithm, Prim's algorithm; Connectivity in a graph-Kosaraju's algorithm

String Matching Algorithms: Naive algorithm, Knuth morris pratt algorithm, Boyer moore algorithm, Rabin karp algorithm

Real world applications: Social networking, Spell checkers, Search engines, Spam filters

Self Learning Topics (SLTs): *String manipulations (https://www.programiz.com/cprogramming/ string-handling-functions), String compression - Run Length Encoding (https://www.naukri.com/ code360/library/run-length-encoding) Practice problems (Reference1: Prob 13.18)*

LABORATORY COMPONENT

List of Experiments

Experiment-I

1. Program to implement initialization of array and perform array operations
2. Program to implement searching operation on array using Binary Search
3. Program to implement sort operation on array using Bubble sort

Experiment-II

4. Program to implement Quick sort
5. Program to implement Merge sort

Experiment-III

6. Program to implement Bitonic generator sort
7. Program to implement Fibonacci search
8. Program to implement interpolation search

Experiment-IV

9. Program to perform following binary tree operations
   i) creation ii) insertion of a node iii) traversal using recursion

Experiment-V

10. Program to perform following binary tree traversal operations without recursion.
    i) Inorder ii) Preorder iii) Postorder

Experiment-VI

11. Program to perform following binary search tree operations
    i) insertion ii) deletion of a node.

Experiment-VII

12. Program to implement AVL tree construction

Experiment-VIII

13. Program to implement search and insert operations on Trie

Experiment-IX

14. Program to implement heap sort

Experiment-X

15. Program to implement Graph Representations
16. Program to implement the following graph traversal techniques
    a) Depth first search b) Breadth first search

Experiment-XI

17. Program to implement Topological sort
18. Program to implement Kruskal's Algorithm

Experiment-XII

19. Program to implement Knuth - Morris - Pratt (KMP) Algorithm
20. Program to implement Boyer Moore Algorithm
21. Program to implement Rabin Karp Algorithm

Textbook(s):

1. Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009

Reference Book(s):

1. Reema Thareja, *Data Structures Using C*, 2nd ed., New Delhi: Oxford University Press, 2014
2. Mark Allen Weiss, *Data Structures and Algorithm Analysis in C*, 2nd ed., New Delhi: Pearson Education India, 2002
3. E Balagurusamy, *Data Structure Using C*, 1st ed., Chennai: McGraw Hill Education, 2017
4. Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudo code Approach with C*, 2nd ed., USA: Cengage Learning, 2007

Web and Video link(s):

1. https://nptel.ac.in/courses/106102064; *NPTEL Video Lecture on Data Structures and Algorithms Prof. Naveen Garg, IIT Delhi*
2. 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 using C Laboratory Manual and Record Book,* Department of IT, KITSW

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: analyze the performance and behavior of advanced sorting/searching algorithms and tree structures to determine their suitability for different data organization and access scenarios

CO2: apply operations on binary search trees, threaded binary trees, AVL trees, and red-black trees to efficiently manage hierarchical data structures

CO3: analyze the structural and functional differences among heap trees, trie trees, multiway search trees, and graphs to determine their suitability for various indexing, sorting, and traversal operations

CO4: analyze the efficiency and applicability of graph traversal and string matching algorithms by comparing their computational complexities and use-case scenarios

(based on psychomotor skills acquired from laboratory component)

CO5: develop programs using sorting techniques on unsorted data and searching techniques to retrieve the data very effectively

CO6: develop programs using binary search tree, AVL tree, Red black tree and heap trees to

	allow fast lookup, addition and removal of data item
CO7:	build various balanced search trees such as B-trees and B+-trees, Tries for efficiently storing and retrieving the data
CO8:	construct the graphs and string manipulation algorithms for organizing and retrieving the data

Course Articulation Matrix (CAM):		**U24IT302 ADVANCED DATA STRUCTURES**												
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	**U24IT302.1**	2	2	2	1	-	-	-	-	-	-	2	2	2
CO2	**U24IT302.2**	2	2	2	2	-	-	-	-	-	-	2	2	2
CO3	**U24IT302.3**	3	3	3	2	-	-	-	-	-	-	2	3	3
CO4	**U24IT302.4**	3	3	3	2	-	1	-	-	-	-	2	3	3
CO5	**U24IT302.5**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO6	**U24IT302.6**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO7	**U24IT302.7**	3	3	3	2	-	-	1	1	1	-	2	3	3
CO8	**U24IT302.8**	3	3	3	2	-	1	1	1	1	-	2	3	3
U24IT302		**2.5**	**2.5**	**2.5**	**1.87**	**-**	**1**	**1**	**1**	**1**	**-**	**2**	**2.5**	**2.5**

SOFTWARE ENGINEERING

Class: B.Tech. III -Semester		**Branch**	**:**	IT
Course Code	**:** **U24IT303**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E)	**:** **2-1-0-4-7**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:** **36 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: software engineering fundamentals and different process models

LO2: different types of software modeling designs & patterns

LO3: user interface design and different testing methods for a given software

LO4: estimating quality & total time needed to complete the project using different metrics

THEORY COMPONENT

UNIT-I	**9 Hrs**

The Nature of Software: The nature of software, Software application domains, Legacy software

Software Engineering : Software process, Software development myths

Process Models: Prescriptive process models, Specialized process models

Principles That Guide Practice: Communication principles, Planning principles, Modeling principles, Construction principles

Real world applications : Analyze the features of various process models by applying them to banking software and e-commerce software

Self-Learning Topics (SLTs)*: Unified process (Text1: topic 4.3), Personal and team process models (Text1: topic 4.4), Deployment principles (Text1: topic 7.3.5)*

UNIT-II	**9 Hrs**

Understanding Requirements: Requirement engineering, Establishing the groundwork, Eliciting requirements, Developing use cases, Building the analysis model, Negotiating requirements, Validating requirements

Requirements Modeling: Requirements analysis, Scenario-based modeling, UML models that supplement the use case

Architectural Design: Software architecture, Architectural styles

Real world applications : Gather the requirements for banking software and create UML diagrams based on those requirements

Self-Learning Topics (SLTs): *Architectural design (Text1: topic 13.6)*

UNIT-III	**9 Hrs**

User Interface Design: The golden rules, User interface analysis and design, Web app and mobile interface design

Software Testing Strategies: Test strategies for conventional software, validation testing

Testing Conventional Applications: Software testing fundamentals, White box testing, Basis path testing, Control structure testing

Real world applications : Case study on testing the user interface of college website

Self-Learning Topics (SLTs): *System testing (Text1: topic 22.8), Black-box testing (Text1: topic 23.6)*

UNIT-IV	9 Hrs

Product Metrics: Measures, Metrics and indicators, Metrics for the requirements model, Metrics for the design model, Metrics for source code, Metrics for testing, Metrics for maintenance
Process and Project Metrics: Metrics in the process and project domains, Software measurement, Metrics for software quality
Project Scheduling: Project scheduling
Real world applications : Case study for analyzing the process and product metrics for the campus management system of a university

Self-Learning Topics (SLTs): *Integrating metrics within the software process (Text1: topic 32.4), Earned value analysis(Text1: topic 34.6*

Textbook(s):

1. Roger S. Pressman, *Software Engineering*, 8th ed., New Delhi **:** Tata McGraw Hill, 2019

Reference Book(s):

1. IAN Somerville, *Software Engineering*, 6th ed., New Delhi **:** Pearson Education, 2002
2. Deepak Jain, *Software Engineering*, 1st ed., Australia : Oxford University Press, 2008
3. Jalote and Pankaj, *Integrated Approach to Software Engineering*, 1st ed., New Delhi: Narosa, 1993

Web and Video link(s):

https://archive.nptel.ac.in/courses/106/105/106105182; NPTEL Video Lecture on Software Engineering by Prof. Rajib Mall, Professor of CSE, IIT Kharagpur

Course Learning Outcomes (COs):

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

CO1: apply software engineering principles and process models to develop, maintain, and enhance software solutions across different application domains and legacy systems
CO2: analyze various requirements modeling approaches and architectural styles to evaluate their impact on the quality, feasibility, and scalability of the software design
CO3: identify appropriate user interface design and software testing strategies for development of software
CO4: utilize user interface design principles and software testing strategies to develop functional, user-friendly, and reliable software applications

Course Articulation Matrix (CAM):		U24IT303 SOFTWARE 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	U24IT303.1	2	2	-	-	-	-	-	1	-	1	1	1	-
CO2	U24IT303.2	2	2	1	1	-	-	-	1	-	1	1	-	2
CO3	U24IT303.3	2	2	2	2	1	-	-	1	-	1	2	2	-
CO4	U24IT303.4	2	2	2	2	1	-	-	1	-	1	2	2	2
U24IT303		**2**	**2**	**1.66**	**1.66**	**1**	**-**	**-**	**1**	**-**	**1**	**1.5**	**1.66**	**2**
3 – HIGH, 2 – MEDIUM, 1 – LOW														

DATABASE MANAGEMENT SYSTEMS

Class: B.Tech. III –Semester			**Branch :**	IT
Course Code	**:**	**U24IT304**	**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:** database System Concepts and Architecture
- **LO2:** data modeling using the Entity-Relationship Model, Relational Data Model, Relational database Constraints
- **LO3:** distinct normalization techniques on database systems and query optimization technique
- **LO4:** transaction processing, concurrency control, database recovery techniques

THEORY COMPONENT

UNIT-I	9 Hrs

Databases and Database Users: Introduction, Characteristics of the database approach, Actors on the scene, Workers behind the scene, Advantages of using a DBMS, When not to use a DBMS
Database System Concepts and Architecture: Data models, Schemas and instances, Three-schema architecture and data independence, Database languages and interfaces, Classification of database management systems, Introduction to NoSQL databases
The Relational Data Model, Relational Database Constraints: Relational model concepts, Relational constraints and the Relational database schemas, Update operations and dealing with constraint violations
Real world applications : Database requirement collection for university student information system and banking application

Self Learning Topics (SLTs): *The database system environment (Text1: chapter 1)*

UNIT-II	9 Hrs

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
Relational Database Design by ER-to-Relational Mapping: Relational database design using ER-to-Relational mapping
The Relational Algebra and Relational Calculus: Basic relational algebra operations, Examples of queries in relational algebra, The tuple relational calculus
Real world applications : ER diagrams for university student information system and banking application

Self Learning Topics (SLTs): *Enhanced entity-relationship (Text1: chapter 8), Domain relational calculus (Text1: chapter 8)*

UNIT-III	9 Hrs

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

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

Real world applications : Convert ER diagrams to relations and normalize the relations of university student information system and banking application

Self Learning Topics (SLTs): *Multivalued dependency and fourth normal form, Join dependencies and fifth normal form (Text1: chapter 15)*

UNIT-IV	**9 Hrs**

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

Real world applications : Implement the concurrent way of accessing of university student information system and banking application using different concurrency control methods

Self Learning Topics (SLTs): *Database Security and Authorization: Introduction to database security issues, Discretionary access control based on granting and revoking privileges (Text1: chapter 24)*

LABORATORY COMPONENT

List of Experiments

1. Queries on DDL and DML statements
2. Queries on TCL and 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. Develop SQL statements to create simple, composite indexes, user-defined data types, views, sequences
8. Develop sample PL/SQL programs using conditional and iterative statements
9. Develop PL/SQL programs using cursors and parameterized cursors
10. Develop PL/SQL programs to handle exceptions
11. Develop PL/SQL programs using stored procedures and functions
12. Develop PL/SQL programs for creating triggers

Textbook(s):

1. Ramez Elmasri and Shamkanth B. Navathe, *Fundamentals of Database Systems*, 6th ed., New Delhi : Pearson Education, 2010

Reference Book(s):

1. Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems*, 3rd ed., New Delhi : McGraw-Hill Education, 2002
2. Abraham Silberschatz, Henry F.Korth and S.Sudarshan, *Database System Concepts*, 3rd ed., USA : McGrawHill Education, 1997
3. Thomas Connolly and Carolyn Begg, *Database Systems*, 3rd ed., New Delhi : Pearson Education, 2003

Web and Video link(s):

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):

1. *Database Management Systems Laboratory Manual and Record Book,* Department of IT, 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: construct the database management system using relational data model

CO2: design the databases using ER model for the given real world problem

CO3: design the database by using normalization techniques to reduce redundancy

CO4: apply locking techniques for concurrent transactions and recover the database from failures

(based on psychomotor skills acquired from laboratory component)

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

CO6: design various database objects like indices and sequence using SQL queries

CO7: develop block structured programming using cursors to retrieve, update or modify the records in the database

CO8: develop PL/SQL programs that handle exceptions, implement stored procedures & functions and create database triggers to enhance the reliability, modularity, and automation of database operations.

Course Articulation Matrix (CAM):		**U24IT304 DATABASE MANAGEMENT SYSTEMS**												
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	**U24IT304.1**	2	1	2	1	-	-	-	-	-	-	-	2	1
CO2	**U24IT304.2**	2	1	2	1	-	-	-	-	-	-	-	2	1
CO3	**U24IT304.3**	2	1	2	2	-	-	-	-	-	-	-	2	1
CO4	**U24IT304.4**	2	1	1	1	-	-	-	-	-	-	-	1	1
CO5	**U24IT304.5**	2	1	2	1	1	1	1	-	-	-	-	2	1
CO6	**U24IT304.6**	2	1	2	1	1	1	1	-	-	-	-	2	1
CO7	**U24IT304.7**	1	1	1	1	1	1	1	-	-	-	-	1	1
CO8	**U24IT304.8**	2	1	2	1	1	1	1	-	-	-	-	2	2
U24IT304		**1.87**	**1**	**1.75**	**1.2**	**1**	**1**	**1**	-	-	-	-	**1.75**	**1.12**

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Class: B.Tech. III –Semester			**Branch**	:	IT
Course Code	:	**U24IT305**	**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: programming paradigms and java basics

LO2: classes, methods and strings

LO3: inheritance, dynamic method dispatch, interfaces and packages

LO4: using I/O, exception handling and multithreading methods

THEORY COMPONENT

UNIT-I	**9 Hrs**

Programming Paradigms: Procedural programming, Modular programming, Object oriented programming (OOP), Generic programming

Java Basics: An overview of java, Data types, Variables and arrays, Operators, Control statements

Introducing Classes: Class fundamentals, Declaring objects, Object reference variables, Introducing methods

Real world applications : Bank account management system : A simple application to create bank accounts, deposit and withdraw money, and display account information

Self Learning Topics (SLTs): *The history and evolution of Java, Lexical issues like keywords, identifiers, literals and comments (Text1: Chapter 2), Type conversions and casting (Text1: Chapter 3)*

UNIT-II	**9 Hrs**

Classes and Methods: Overloading methods, *this* keyword, Passing and returning 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: Exploring String, StringBuffer, StringBuilder and StringTokenizer classes

Real world applications : Library book management system : This application allows to manage books in a library like add books, compare books by ratings, and calculate average ratings using recursion and variable arguments, demonstrating advanced class and method features

Self Learning Topics (SLTs): *Overloading vararg methods, Varargs and ambiguity(Text1: Chapter 7), Anonymous inner classes(Text1: Chapter 25)*

UNIT-III	**9 Hrs**

Inheritance: Inheritance basics, Types of inheritance, Using *super*, Method overriding, Order of constructors execution, Dynamic method dispatch, Abstract classes, *final* with inheritance, Object class

Interfaces: Defining an interface, Implementing interfaces, Nested interfaces, Variables in interfaces, Extending interfaces

Packages: Defining a package, Packages and member access, Importing packages

Real world applications : Employee management system application uses inheritance for defining manager and developer classes which inherit from employee class and classes are organized into organization.employees, organization.roles packages and taxable interface implemented by employee class

Self Learning Topics (SLTs): *Accessing implementations through interface references, Default interface methods, Use static methods in an interface, private interface methods (Text1: Chapter 9)*

UNIT-IV	**9 Hrs**

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 statement, *throw*, *throws*, *finally* keywords, Creating your own exception subclasses.

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

Real world applications: ATM transaction simulator application simulates ATM transactions from multiple users accessing the same account concurrently and it handles insufficient balance using custom exceptions and synchronizes access to prevent race conditions

Self Learning Topics (SLTs): *try-with resource, multi catch, chained exception, precise rethrow (Text1: Chapter 10), Serialization: Writing and reading objects to and from the file-(Text1: Chapter 22)*

LABORATORY COMPONENT

List of Experiments

Experiment-I

1. Develop a program to demonstrate different operators in java
2. Develop a program to demonstrate control structures i.e. different forms of if statement and switch statement in java.

Experiment-II

3. Develop a program to read an array, calculate sum of those elements and display input array along with the result using *for-each* loop
4. Develop a program to read a matrix and display whether it is an identity matrix or not. Use *civilized form* of *break* statement
5. Develop a program to define a two dimensional (2D) array where each row contains different number of columns i.e. jagged array & display the 2D-array using *for-each loop*.

Experiment-III

6. Develop a program to define a student class with data members rollno, name, branch, total marks and member functions to read and display the student details
7. Develop a program to demonstrate *this* keyword
8. Develop a program to demonstrate object reference variable
9. Develop a program to illustrate overloading of methods
10. Develop a program to demonstrate passing and returning objects

Experiment-IV

11. Develop a program to demonstrate variable length argument (using array and ellipsis notation)
12. Develop a program to illustrate constructors overloading and garbage collection
13. Develop a program to demonstrate nested and inner classes
14. Develop a program to demonstrate *static* variables, *static* methods, and *static* blocks

Experiment-V

15. Develop a program to read at least five strings from command line argument and display them in sorted order
16. Develop a program to demonstrate wrapper class by reading N number of integers from command line and display their sum
17. Develop a program to demonstrate wrapper class by reading N floating point numbers from command line and display their average

Experiment-VI

18. Develop a program to accept a string, count number of vowels and remove all vowels
19. Develop a program to accept a string, count number of vowels and remove all vowels using *StringBuffer* class
20. Develop a program to accept a line of text, tokenize the line using *StringTokenizer* class and print the tokens in reverse order

Experiment-VII

21. Develop a program to demonstrate single level-inheritance
22. Develop a program to demonstrate multilevel-inheritance using *super* keyword
23. Develop a program to demonstrate method overriding

Experiment-VIII

24. Develop program to demonstrate dynamic method dispatch
25. Develop a program to demonstrate use of abstract class
26. Develop a program to demonstrate the use of overriding *equals()* method of an Object class

Experiment-IX

27. Develop a program to demonstrate interfaces and extending interfaces
28. Develop a program to demonstrate implementation of nested interfaces

Experiment-X

29. Develop a program to create a package and demonstrate to import that *package* into any java program (Consider the behavior of all access specifiers)

Experiment-XI

30. Develop a program to demonstrate *try-catch* block
31. Develop a program to demonstrate *throw* clause
32. Develop a program to demonstrate *throws* clause
33. Develop a program to demonstrate *re-throw* an exception, and *finally* block

Experiment-XII

34. Develop a program to demonstrate read/write/copy a file using *byte stream* and also using *character stream*
35. Create two threads using Thread class or Runnable interface. One thread displays "Hello" for every half second and another thread displays "Hai" for every second
36. Create an Account class which implements deposit, withdrawal and getBalance operations. Provide locking such that account details are consistent when these operations are invoked by the account holders simultaneously who have shared account
37. Develop a solution for producer-consumer problem using thread synchronization and communication, where a producer produces a set of integers and consumer consumes those integer

Textbook(s):

1. Herbert Schildt, *Java The Complete Reference*, 13th ed., New Delhi : McGraw-Hill Education, 2019

Reference Book(s):

1. Herbert Schildt and Dale Skrien, *Java Fundamentals (A Comprehensive Introduction)*, New Delhi : McGraw-Hill Education, 2013

2. Balaguruswamy, *Programming with Java: A Primer*, 7th ed., New Delhi : McGraw-Hill Education India, 2019
3. KathySierra and BertBates, *Head First Java*, O'Reilly Publications, 2nd edition, 2005
4. Harvey Deitel and Paul J. Deitel, *Java How to Program,* 11th ed., USA : Pearson Publications, 2018

Web and Video link(s):

https://nptel.ac.in/courses/106105191; *NPTEL Video Lecture on Java Programming* by Prof. Debasis Samanta, Professor of CSE, IIT Kharagpur

Laboratory Manual (for laboratory component):

1. *Object Oriented Programming through Java Manual and Record Book,* Department of IT, 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: examine the strengths and limitations of various programming paradigms, including object-oriented and modular programming, to determine their suitability for solving different types of programming problems in Java

CO2: evaluate the advantages and limitations of different string handling classes (String, StringBuffer, StringBuilder, StringTokenizer) and object-oriented concepts to optimize performance and memory management in Java applications

CO3: utilize inheritance, interfaces, and packages in Java to design modular, reusable, and maintainable code by implementing object-oriented principles and managing class relationships

CO4: apply different exception handling mechanisms and multithreading approaches in Java to determine their impact on application stability, error management, and performance

(based on psychomotor skills acquired from laboratory component)

CO5: develop solutions using for-each loops, exception handling, and other Java features to create functional programs for data manipulation, user input processing, and matrix operations

CO6*:* develop java programs using classes, constructors and various string operations to solve practical problems

CO7*:* develop java programs that demonstrate the use of inheritance method overriding, dynamic method dispatch, abstract classes, and interfaces, along with practical application of the super keyword, equals() method, and nested interfaces to design modular and reusable code

CO8*:* develop java programs that demonstrate package creation and importing, exception handling, file I/O operations with byte and character streams, multithreading with synchronization, and implement real-world problems like producer-consumer and thread synchronization for concurrent programming.

Course Articulation Matrix (CAM):		U24IT305 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	U24IT305.1	2	2	2	-	-	-	-	-	-	-	1	1	1
CO2	U24IT305.2	2	2	2	-	-	-	-	-	-	-	1	1	1
CO3	U24IT305.3	2	2	3	-	-	-	-	-	-	-	1	2	2
CO4	U24IT305.4	2	2	3	-	-	-	-	-	-	-	1	2	2
CO5	U24IT305.5	1	1	1	-	1	-	1	1	1	-	1	1	1
CO6	U24IT305.6	1	2	2	-	2	-	1	1	1	-	1	1	1
CO7	U24IT305.7	1	2	3	-	2	-	1	1	1	-	1	2	2
CO8	U24IT305.8	1	2	3	-	2	-	1	1	1	-	1	2	2
U24IT305		**1.5**	**1.87**	**2.37**	**-**	**1.75**	**-**	**1**	**1**	**1**	**-**	**1**	**1.5**	**1.5**

SOFT AND INTERPERSONAL SKILLS LABORATORY

Class: B.Tech. III -Semester & IV-Semester		**Branch:** Common to all Branches	
Course Code:	**U24VA306B**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-2-2-4**	**CIE:**	**100 %**
Total Number of Teaching Hours:	**24 Hrs**	**ESE:**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: analysing self and learning to overcome possible threats
LO2: group dynamics to demonstrate respect for the opinions and beliefs of group
LO3: effective presentations using visual aids and analyzing the videos
LO4: communicating professionally, making resume in line with industry expectations

LIST OF ACTIVITIES

Activity 1: Ice-breaking, Self-Awareness and Just a Minute (JAM)
Activity 2: Self-Introduction & Personal SWOT Analysis
Activity 3: Reading Comprehension & Critical Thinking
Activity 4: Active Listening & Non-Verbal Observation (Video + Peer Practice)
Activity 5: Group Discussion - 1
Activity 6: Resume Building & LinkedIn Profile Review
Activity 7: Group Discussion - 2
Activity 8: Presentation Skills with PPT / Storytelling
Activity 9: Group Discussion - 3
Activity 10: Mock Interviews: Technical & HR
Activity 11: Email Etiquette & Professional Communication
Activity 12: Workplace Etiquette & Conflict Resolution

Course Learning Outcomes (COs):

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

CO1: deliver concise & effective self-introduction and demonstrate confidence, spontaneous speaking skills within a limited time
CO2: conduct a personal SWOT analysis to identify areas for self-improvement and career development
CO3: demonstrate clear & respectful communication, leadership, positive attitude and improve interpersonal relationship by actively participating in group discussions, collaborative tasks & mock interviews
CO4: create a professional resume, develop a LinkedIn profile and demonstrate effective video communication by making effective videos on self-introduction, personal SWOT analysis & spontaneous speaking activity along with email & workplace etiquette

Textbook(s):

1. Krishna Mohan & Meera Benerji, *Developing Communications Skills*, 2nd ed., New Delhi: Mcmillan Publications, 2005

Course Articulation Matrix (CAM):		U24VS306B 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	PSO 1	PSO 2
CO1	U24VA306B.1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO2	U24VA306B.2	-	-	-	-	-	-	2	3	3	-	1	-	-
CO3	U24VA306B.3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO4	U24VA306B.4	-	-	-	-	-	-	1	2	3	-	1	-	-
U24VA306B		-	-	-	-	-	-	1.5	2.25	3	-	1	-	-
3 – HIGH, 2 – MEDIUM, 1 - LOW														

Programming Skill Development Lab-2

Class: B.Tech. III -Semester		**Branch:** IT	
Course Code:	**U24SE307**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-2-2-4**	**CIE :**	**100%**
Total Number of Lab Hours:	**36 Hrs**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: fundamentals on data structures and their implementation with arrays
LO2: representation of data structures using stacks and various forms of queues
LO3: representing the data using various types of linked lists
LO4: various sorting techniques on the given data and representing different hashing techniques

LABORATORY COMPONENT

S. No.	List of Experiments
1.	a) Develop a C-program to shrink an array by removing triplets that satisfy given constraints. Given an integer array, shrink it by removing adjacent triplets that satisfy the given constraints and return the total number of elements in the resultant array. Input: A[] = [1, 2, 3, 5, 7, 8], k = 2 . Output: 3 b) Develop a C-program to find the maximum and minimum elements in an array. c) Develop a C-program to represent a sparse matrix using a 2D array
2.	a) Develop a C-program to allocate memory for an integer array dynamically and accept user's input. b) Implement a C-program to dynamically allocate a 2D matrix and take input from the user. c) Develop a function to free dynamically allocated memory after use
3.	a) To design and implement a web browser navigation system that mimics the behavior of modern browsers using two stacks to manage Back and Forward navigation using C-language. b) Implement a C- program to create and manage multiple stacks in a single array. c) Write a C-program to Convert an **infix expression** (e.g., (A + B) * C) to it**s postfix form** using a stack.
4.	a) Develop a C-program to implement a **circular queue** using an array. b) Implement a C-program **priority queue** where elements are dequeued based on priority. c) Develop a C-program simulate a **printer queue system** where documents are printed in FIFO order.
5.	a) Write a C-program Tower of Hanoi using Iterative Stack**:** Solve the Tower of Hanoi problem using a stack instead of recursion b) **Job Scheduling Simulation:** Implement a C-program queue-based job scheduler where tasks are executed in FIFO order, but some high-priority jobs can be inserted at the front. c) **Circular Queue without Extra Space:** Implement a C-program circular queue without using extra space or an additional array.
6.	a) Given an array-based implementation and a linked list-based implementation of a list, compare the worst-case complexities for insertion, deletion, and search b) Design an efficient method to merge two sorted singly linked lists without using extra space. c) Consider a scenario where a linked list is frequently modified. How would you optimize

	memory usage during frequent insertions and deletions?
7.	a) Implement a C-programs on one dimensional array and two-dimensional arrays b) Develop a C-program to **detect and remove** a cycle in a singly linked list **without using extra space.** **Hint:** Use Floyd's Cycle Detection Algorithm (Tortoise and Hare approach). c) Given a circular linked list, implement a function to split it into two equal halves. If the list has an odd number of nodes, the first list should have one extra node. Input: 1 -> 2 -> 3 -> 4 -> 5 -> 6 -> (back to 1) Output: Two lists: (1 -> 2 -> 3) and (4 -> 5 -> 6)
8.	a) Develop a function to **remove all duplicate nodes** from an **unsorted** singly linked list **without using extra space** (no hash set or array allowed). Input: 4 -> 2 -> 3 -> 2 -> 1 -> 3 Output: 4 -> 2 -> 3 -> 1 b) Given a **linked list-based stack**, implement a function to **sort the stack in O(n log n) time using recursion without using extra space.** c) Develop a C-program to find two odd occurring elements in an array without using any extra space given an integer array, duplicates appear in it an even number of times except for two elements, which appear an odd number of times. Find both odd appearing elements without using any extra memory. For example, Input: arr[] = [4, 3, 6, 2, 4, 2, 3, 4, 3, 3] Output: The odd occurring elements are 4 and 6 6 appears once. 2 appears twice. 4 appears thrice. 3 appears 4 times.
9.	a) Implement a C-program s**election sort** on a **linked list** instead of an array, achieving an in-place sorting mechanism. **Follow-up:** Optimize it to work in **$O(n^2)$** time without using extra space. b) Given an array of large **floating-point numbers**, implement **Radix Sort** to sort them efficiently. **Example: Input: [3.141, 2.718, 1.414, 4.669]** **Output: [1.414, 2.718, 3.141, 4.669]**
10.	a) Develop a C-program for given an array of integers, sort it using **Insertion Sort** but with the constraint that you can swap **only adjacent elements** and minimize the number of swaps. **Example: Input: [8, 4, 2, 9] ,Output: [2, 4, 8, 9] (with minimum swaps)** d) Given an array of integers, sort it using **Insertion Sort** but with the constraint that you can swap **only adjacent elements** and minimize the number of swaps. Example: Input: [8, 4, 2, 9] , Output: [2, 4, 8, 9] (with minimum swaps)
11.	a) Implement C-program for Shell Sort with a custom gap sequence that minimizes the worst-case complexity. Compare the performance of: i. Knuth's sequence ii. Hibbard's sequence iii. Original Shell's sequence Run the sort on an input of 1 million elements and report the execution time of each sequence. b) Write a C-program for Sort an array in one swap whose two elements are swapped given an array where all its elements are sorted in increasing order except two swapped elements, sort it in linear time. Assume there are no duplicates in the array. For example, Input: A[] = [3, 8, 6, 7, 5, 9] or [3, 5, 6, 9, 8, 7] or [3, 5, 7, 6, 8, 9] Output: A[] = [3, 5, 6, 7, 8, 9]
12.	a) Design a custom hash function for a dictionary that stores words and their meanings. Ensure minimal collisions when hashing large sets of words (e.g., 100,000 words). b) Implement Chaining (Open Hashing) using a binary search tree (BST) at each bucket

		instead of a linked list. Insert, Search, and Delete should work in O(log k) time, where k is the number of elements in a bucket.

Text Book(s):

1. Debasis Samanta, *Classic Data Structures*, 2nd ed., New Delhi: Prentice Hall India, 2009.
2. Reema Thareja, *Data Structures usig C,* 2nd ed., New Delhi: Oxford University Press, 2022.
3. E Balagurusamy, *Data Structure Using C*, 1st ed., Noida: McGraw Hill Education, Uttar Pradesh, 2017.

Reference Book(s):

1. Paul Deitel, Harvey Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, 9th ed., USA: Pearson Education Limited, 2022.
2. Richard F. Gilberg and Behrouz A. Forouzan, *Data Structures: A Pseudocode Approach with C,* 2nd ed., USA: Cengage Learning, 2007.

Course Learning Outcomes (COs):

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

- **CO1:** apply static & dynamic memory management for performing different operations using arrays
- **CO2:** analyze the linear data structures stacks and queues in organizing the data.
- **CO3:** organize and retrieve the data through various linked list representations in non-contiguous memory storage
- **CO4:** compare different sorting techniques, hashing techniques for efficient utilization of data

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

PRACTICUM

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**	**CIE**	**:** **100 %**
Total Number of Teaching Hours	**:**	**-**	**ESE**	**:** **-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

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

(i) Practicum is a mandatory semester project work.

(ii) Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)

(iii) Allotment of Practicum topics for students:

- **Practicum matrix:** In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.

Course	U24IT301	U24IT302	U24IT303	U24IT304	U24IT305
Students allotted to different courses	B24IT001	B24IT014	B24IT027	B24IT040	B24IT053
	B24IT002	B24IT015	B24IT028	B24IT041	B24IT054
	B24IT003	B24IT016	B24IT029	B24IT042	B24IT055
	B24IT004	B24IT017	B24IT030	B24IT043	B24IT056
	B24IT005	B24IT018	B24IT031	B24IT044	B24IT057
	B24IT006	B24IT019	B24IT032	B24IT045	B24IT058
	B24IT007	B24IT020	B24IT033	B24IT046	B24IT059
	B24IT008	B24IT021	B24IT034	B24IT047	B24IT060
	B24IT009	B24IT022	B24IT035	B24IT048	B24IT061
	B24IT010	B24IT023	B24IT036	B24IT049	B24IT062
	B24IT011	B24IT024	B24IT037	B24IT050	B24IT063
	B24IT012	B24IT025	B24IT038	B24IT051	B24IT064
	B24IT013	B24IT026	B24IT039	B24IT052	

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

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

1. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
2. To complete the Practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the class work time table 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 class work timetable and outside the class work hours during weekdays.***

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

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

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

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

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

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

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

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

(b) **Working Model**: Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.

(c) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and PPT presentation.

- What was the objective of the practicum assigned?
- What are the main responsibilities and tasks for practicum?
- What knowledge and skills from the coursework are applied in the practicum?
- What new knowledge and skills are acquired during the practicum?
- In what ways, can the practicum be helpful for the professional career?
- What gaps are identified in your practicum work?
- What improvements or changes you suggest for addressing the identified gaps for future work?

(d) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the course teacher as per the schedule notified by the department

(f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

Course Articulation Matrix (CAM):		**U24EL308 PRACTICUM**											
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	**U24EL308.1**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	**U24EL308.2**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	**U24EL308.3**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	**U24EL308.4**	2	2	2	2	2	2	2	2	2	2	2	2	2
U24EL308		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

Course code U24ELXYY: ***X represents semester, YY represents ETA course serial number***

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA/SAA)			
Class: B.Tech. III Semesters	**Branch:** Common to all branches		
Course Code :	**U24VA309(SE/SA)ZZZ**	**Credits :**	**1**
Hours/Week (L-T-P-O-E) :	**0-0-0-2-2**	**CIE :**	**100%**
Total Number of Teaching Hours :	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

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

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

(a) Each SEA/SAA activity is treated as one credit course
(b) Student must select one activity per semester, through first 04 semesters, from the courses listed under SEA/ SAA, before commencement of the semester.
(c) Students are required to earn minimum 04 credits under SEA/SAA, by completing minimum 02 credits through SEA and minimum 02 credits through SAA
(d) To complete these activities student shall work outside the class work hours, during weekends, holidays, semester breaks, etc.,
(e) If a student is not able to attend/ fulfill performance requirements, he/she shall be dropped from the course and shall have to enroll 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 analyze the issue and propose unique possible solutions to the social issues/challenges. Practice to acquire necessary skills to seek new opportunities in their personal and professional life.

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

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

- 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.
- Fieldwork consists of three phases: preparation, the actual activity and feedback
- **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.**
- 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.
- Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
- 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.
- **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/ Achievers / Renowned personalities:

(a). **In case of socially relevant problems/ activities of SEA/SAA: E**minent 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.

- **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
- On fieldwork, student is expected to demonstrate solid time management, organizational and note taking skills during fieldwork
- **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

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

- 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 & practice sessions, if any) shall be appended as annexure in the report to be submitted for course evaluation.

- **Feedback:** The learning, the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.
    - During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentation and report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.

(e) **Demonstration / Presentation and Report**: Student after presentation/demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit and submit a report, in the prescribed format, to the faculty counselor for award of grade.

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

- ***Faculty counselor approval***: In week (-1), in consultation with faculty counselor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

- ***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.

- ***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 counselor and the nodal centre.

- ***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.

- ***Report writing:*** After successful demonstration/presentation, student shall write a 2–3-page report and submit the same to the faculty counselor. 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 counselors, consolidate them, and submit the final grades to the examination branch, within one week of the last day of instruction. Evaluation of SEA/SAA activities shall be completed as and when students are ready, but not later than week (N+1).

The CIE for SEA/SAA is as follows:

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

Note:

(a) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.

(b) **Report:** Each student is required to submit a well-documented report on the chosen SEA/SAA topic as per the format specified by *department level SEA/SAA coordinator.*

(c) **Anti-Plagiarism Check:** The SEA/SAA report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(d) **Requirements for passing the course:** A student is deemed to have passed SEA/SAA if he/she
   a. successfully demonstrates/presents the skills attained at the end of course as per the schedule notified by the nodal centre, **and**
   b. scores a minimum of 40 marks in the CIE of the course

(e) **Supplementary examination:** If a student fails in SEA/SAA activity of a particular semester, he must complete the same by enrolling it in the next higher semesters.

Course Learning Outcomes (COs):
After completion of this course, the students should be able to…

CO1: integrate the five dimensions of physical, emotional, cognitive, spiritual and social aspects in life for holistic development and demonstrate social sensibility
CO2: interact effectively through written, oral and nonverbal communication with external-world in a professional, sensitive and culturally relevant manner
CO3: analyze the issues related to social empowerment / self-accomplishment, demonstrate problem-solving skills, articulate solutions and demonstrate social sensibility
CO4: demonstrate the generic competencies in making a well-documented report and an effective oral presentation with PPTs portraying knowledge, skills, qualities acquired through fieldwork/practice sessions and social impact of the course learning

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

Course Code: **U24VA XYY(SE/SA)ZZZ**

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

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

EXPERT TALK SERIES

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**	**CIE**	:	**100 %**
Total Number of Teaching Hours	:	**-**	**ESE**	:	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

(a) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.

(b) Learning from industry experts with real-world examples, is important to enhance your educational experience.

(c) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximized 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:

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

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

Supplementary Exam:

(a) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE

(b) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks (MCQs/FiBs ; *duration: 2Hrs*)on the content covered in ETS lectures.

(c) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE

(d) Exam material/resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

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

CO1: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO2: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

CO3: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO4: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		**U24AE310 EXPERT TALK SERIES**												
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	U24AE310.1	1	1	1	1	1	1	1	2	1	2	1	1	1
CO2	U24AE310.2	1	1	1	1	1	1	1	2	1	2	1	1	1
CO3	U24AE310.3	1	1	1	1	1	1	1	2	1	2	1	1	1
CO4	U24AE310.4	1	1	1	1	1	1	1	2	1	2	1	1	1
U24AE310		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

Course code U24AEXYY: ***X represents semester, YY represents ETA course serial number***

4th Semester Syllabi

Sl. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH401D	Discrete Mathematics and Probability, Statistics	2	1	-	6	9	3
2	PCC	U24IT402	Design and Analysis of Algorithms	2	1	2	5	10	4
3	PCC	U24IT403	Python Programming	2	1	2	5	10	4
4	PCC	U24IT404	Operating Systems	2	1	2	5	10	4
5	PCC	U24IT405	Computer Networks	2	1	-	4	7	3
6	VAC	U24VA406A	Quantitative Aptitude and Logical Reasoning	2	-	-	2	4	2
7	SEC	U24SE407	Programming Skill Development Lab - 03	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409 XXXXX	SEA - 4 / SAA - 4	-	-	-	2	2	1
10	AEC	U24AE410	Expert Talk Series-4	-	-	-	1	1	1
11	VAC*	U24CY411*	Environmental Studies*	2*	-	-	3*	5*	-
			Total:	12	5	8	36	61	24
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)									

**For Lateral Entry Students Only*

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 IT)

(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 IT: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT412X	Introduction to Web Programming	2	-	2	-	4	3
2	PCC	U24IT413X	Internet of Things	2	-	2	-	4	3
3	PCC	U24IT414X	Cloud Computing	2	-	2	-	4	3
4	PCC	U24IT415X	Java Full Stack Development	2	-	2	-	4	3
5	PCC	U24IT415X	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 IT: Any Two (02) Skill based Courses -:									
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**O**	**E**	**C**
1	SEC	U24SE412X	Programming for Web Design https://onlinecourses.swayam2.ac.in/nou24_cs12/preview	-	-	6	-	6	3
2	SEC	U24SE413X	Internet of Things using Aurdino/Raspberry Pi https://onlinecourses.swayam2.ac.in/ntr24_ed44/preview	-	-	6	-	6	3
3	SEC	U24SE414X	Cloud Computing using AWS/Google Cloud https://www.coursera.org/specializations/cloud-computing	-	-	6	-	6	3
4	SEC	U24SE415X	Full Stack using JAVA / .NET https://www.coursera.org/specializations/java-fullstack	-	-	6	-	6	3
5	SEC	U24SE416X	Any other skill based course approved by BoS Chair and Dean, AA	-	-	6	-	6	3

B.Tech Honours with Research:

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

DISCRETE MATHEMATICS AND PROBABILITY, STATISTICS

Class: B.Tech. IV - Semester		**Branch:** Common to CSE, CSN, CSO & IT		
Course Code	**:**	**U24MH401D**	**Credits**	**: 3**
Hours/Week (L-T-P-O-E)	**:**	**2-1-0-6-9**	**CIE**	**: 60 %**
Total Number of Teaching Hours :		**36 Hrs**	**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	**9 Hrs**

Foundation: Sets and operations on sets, relations, binary relations, equivalence relations, partial order relations, Hasee 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

Real world applications : Transitive closure of a relation using Warshal's algorithm

Self-Learning Topics (SLTs): *Monoids, Groups. (Reference2: topic 3.2), Pigeonhole principle (Text1: topic 1.7, prob 7.13(2, 3, 4)), Mathematical Induction (Text1: topic 1.10, prob 1.10.1, 1.10.3, 1.10.6)*

UNIT - II	**9 Hrs**

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, solutions of recurrence relations by method of substitution, characteristic roots, solving non-linear recurrence relations**.**

Real world applications : Using recurrence relations, find the computational complexity of binary search, Tower's of Hanoi problem, and Sorting

Self-Learning Topics (SLTs): *Solutions of recurrence relations by generating function method (Text1 : topic 3.4, prob 3.4.4, 3.4.5), Additional problems on recurrence relations (Text1 : topics 3.5 and 3.6, prob 3.5.5, 3.5.6, 3.6.6, 3.6.8, 3.6.10)*

UNIT - III	**9 Hrs**

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

Real world applications : Find the shortest path of a network problem

Self-Learning Topics (SLTs): *Additional problems on* isomorphism *of two graphs(Text book 1, topic:5.2, problems:5.2.3, 5.2.4, 5.2.5)*

UNIT - IV	**9 Hrs**

Statistics: Correlation, 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, Normal and Exponential distributions.

Applications: Fitting of Binomial distribution, Poisson distribution to the given real time data.

Self-Learning Topics (SLTs): *Review of the concepts of probability (Text2: topic 26.4 and 26.5, prob 26.15, 26.20, 26.25), Conditional probability and Bayes theorem (Text2 : topic 26.6, prob 26.26, 26.27), Normal distribution(Text2 : topic 26.16, prob 26.45, 26.47, 26.48), Uniform, exponential distributions (Text2 : topic 26.19)*

Textbook(s):

1. L. Mott, A. Kandel, and T. P. Baker, *Discrete Mathematics for Computer Scientists*, 2nd ed., New Delhi, India: Prentice-Hall of India, 2008.
2. B. S. Grewal, *Higher Engineering Mathematics*, 44th ed., New Delhi, India: Khanna Publishers, 2017.

Reference Book(s):

1. Gupta and Kapoor, *Fundamentals of Mathematical Statistics*, 11th ed., New Delhi : Sultan Chand and sons Publications, 2010
2. J. P. Tremblay, R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, 1st ed., New York, USA: McGraw-Hill, 1975
3. Z. Manna, *Mathematical Theory of Computation*, Reprint ed., USA: Dover Publications, 2003
4. C. L. Liu, *Elements of Discrete mathematics*, 3rd ed., New Delhi : Tata McGraw 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 Learning Outcomes (COs):

On completion of this course, students will be able ,

CO1: apply fundamentals of 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

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

DESIGN AND ANALYSIS OF ALGORITHMS

Class: B.Tech. IV –Semester			**Branch**	**:**	IT
Course Code	**:**	**U24IT402**	**Credits**	**:**	**4**
Hours/Week (L-T-P-O-E)	**:**	**2-1-2-5-10**	**CIE**	**:**	**60%**
Total Number of Teaching Hours	**:**	**60 Hrs**	**ESE**	**:**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: algorithms with time and space complexities

LO2: greedy method and concepts of dynamic programming

LO3: dynamic programming technique and backtracking

LO4: concepts of branch & bound technique, NP-hard and NP-complete problems

THEORY COMPONENT

UNIT-I	9 Hrs

Introduction: Algorithm specification, Performance analysis: Space complexity, Time complexity, Amortized complexity, Asymptotic notation (O, Ω, Θ), Practical complexities: Computing time complexity of iterative and recursive relations, Performance measurement

Elementary Data Structures: Sets and disjoint set union: Introduction, Union and find operations

Divide and Conquer: General method, Defective chessboard, Finding the maximum and minimum, Performance Measurement, Randomized sorting algorithms, Strassen's matrix multiplication

Real world applications : Quick Sort, Merge Sort, Finding minimum and maximum in array

Self Learning Topics (SLTs): *Introduction to algorithms (Reference1: topics 1.1 to 1.6), Merge sort, Quick sort methods (Reference1: topics 8.2, 8.3)*

UNIT-II	9 Hrs

Greedy Method: The General method, Container loading, Knapsack problem, Tree vertex splitting, Job sequencing with deadlines, Optimal storage on tapes, Optimal merge patterns, Single source shortest paths

Dynamic Programming: The General method, Multistage graphs, All-pairs shortest paths, Single source shortest paths: General weights

Real world applications : Loading goods into ships efficiently to maximize value or minimize space, Project planning where jobs with deadlines and profits must be scheduled

Self Learning Topics (SLTs): *Greedy method and its applications (Reference2: chapter 19), Spanning trees (Text1: chapter 4, topic 4.6), Shortest path methods (Text1: chapter 5)*

UNIT-III	9 Hrs

Dynamic Programming: Optimal binary search trees, String editing, 0/1 knapsack, Reliability design, The traveling salesperson problem, Flow shop scheduling

Backtracking: The general method, 8–Queens problem, Sum of subsets, Graph coloring,

Hamiltonian cycles, Knapsack problem

Real world applications : Minimize the average lookup time for frequently accessed elements in databases, Minimizing travel cost or time for delivery routing, logistics, and flight itinerary planning

Self Learning Topics (SLTs): *Binary search trees (Reference2: chapter 13), Backtracking and applications (Text1: chapter 7)*

UNIT-IV	**9 Hrs**

Branch and Bound: The method: Least cost (LC) search, The 15-puzzle: An example, Control abstractions for LC-search, 0/1 knapsack problem, Traveling salesperson

NP-Hard and NP-Complete Problems: Basic concepts: Nondeterministic algorithms, The classes NP-hard and NP-complete, NP-Hard graph problems: Clique decision problem (CDP), Node cover decision problem (NCDP), Traveling salesperson decision problem (TSP)

Approximation Algorithms: Introduction

Real world applications : Path finding puzzles used in AI or gaming

Self Learning Topics (SLTs): *Graph coloring methods (Text1: chapter 7), Introduction to NP-Hard and NP-Complete problems (Text1: chapter 11), Introduction to COOK's theorem (Text1: chapter 11, topic.11.2)*

LABORATORY COMPONENT

List of Experiments

Experiment-I

1. i. Program to implement weighted union for given sets
   ii. Program to implement collapsing find method to find an element in the given sets

Experiment-II

2. Program to implement strassen's matrix multiplication

Experiment-III

3. Program to implement Defective chessboard problem using Divide and Conquer

Experiment-IV

4. Program to implement Graph map coloring using Greedy method

Experiment-V

5. Program to find the maximum profit job sequence from a given array of jobs with deadlines and profits

Experiment-VI

6. Program to implement text compression using Huffman Coding

Experiment-VII

7. Program to find Single Source Shortest Path using Dijkstra's algorithm

Experiment-VIII

8. Program to find All-Pairs Shortest Path using Floyd-Warshall algorithm

Experiment-IX

9. Program to find Optimal Binary Search Tree using Dynamic Programming
10. Program to implement 0/1 Knapsack problem using Dynamic Programming

Experiment-X

11. Program to implement Travelling Salesperson Problem using Dynamic Programming

Experiment-XI

12. Program to find a subset of a given set S = {s1,s2,...,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9, there are two solutions {1,2,6} and {1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution

Experiment-XII

13. Program to implement N-Queen problem using Backtracking

Textbook(s):

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, *Fundamentals of Computer Algorithms*, 2nd ed., Hyderabad, India : Universities Press, 2008

Reference Book(s):

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, *Introduction to Algorithms*, 3rd ed., Cambridge, MA: MIT Press, 2009
2. S. Sridhar, *Design and Analysis of Algorithms*, 1st ed., New Delhi, India: Oxford University Press, 2014
3. Gajendra Sharma, *Design & Analysis of Algorithms*, 4th ed., New Delhi, India: Khanna Books Publishing, 2019

Web and Video link(s):

1. https://nptel.ac.in/courses/106101060; *NPTEL Video Lecture on Design and Analysis of Algorithms by Prof. Abhiram G Ranade, Prof. Ajit A Diwan, Prof. Sundar Viswanathan, IIT Bombay*
2. https://nptel.ac.in/courses/106106131; *NPTEL Video Lecture on NOC:Design and Analysis of Algorithms by Prof. Madhavan Mukund, Chennai Mathematical Institute*

Laboratory Manual (for laboratory component):

1. *Design and Analysis of Algorithms Laboratory Manual and Record Book,* Department of IT, 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: examine the efficiency of algorithms by analyzing time, space, and amortized complexities, and evaluate the effectiveness of divide and conquer strategies and disjoint set operations in solving computational problems

CO2: analyze problem-solving approaches based on greedy and dynamic programming strategies to determine their applicability, correctness, and efficiency in optimizing computational tasks

CO3: develop algorithmic solutions using dynamic programming and backtracking techniques to address complex problems such as optimal binary search trees, TSP, string editing, and constraint satisfaction problems like 8-Queens and graph coloring

CO4: develop algorithmic strategies using branch and bound for solving optimization problems such as 0/1 knapsack and traveling salesperson, and simulate nondeterministic

approaches to address NP-complete problems.

(based on psychomotor skills acquired from laboratory component)

CO5: develop solutions for weighted union and collapsing find operations, implement Strassen's matrix multiplication, and solve the Defective Chessboard problem using divide and conquer techniques

CO6: develop optimal solutions to real-world optimization problems such as job sequencing, knapsack, and shortest paths using the greedy method.

CO7: develop optimal solutions for problems such as Optimal Binary Search Trees (OBST), 0/1 Knapsack, and Traveling Salesperson using dynamic programming techniques.

CO8: develop programs to solve the Sum of Subsets and N-Queen problems using the backtracking method.

Course Articulation Matrix (CAM):		**U24IT402 DESIGN AND ANALYSIS OF ALGORITHMS**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24IT402.1**	2	2	2	-	-	-	-	-	-	-	1	1	1
CO2	**U24IT402.2**	2	2	2	-	-	-	-	-	-	-	1	1	1
CO3	**U24IT402.3**	2	2	3	-	-	-	-	-	-	-	1	2	2
CO4	**U24IT402.4**	2	2	3	-	-	-	-	-	-	-	1	2	2
CO5	**U24IT402.5**	1	1	1	-	1	-	1	1	1	-	1	1	1
CO6	**U24IT402.6**	1	2	2	-	2	-	1	1	1	-	1	1	1
CO7	**U24IT402.7**	1	2	3	-	2	-	1	1	1	-	1	2	2
CO8	**U24IT402.8**	1	2	3	-	2	-	1	1	1	-	1	2	2
U24IT402		**1.5**	**1.87**	**2.37**	**-**	**1.75**	**-**	**1**	**1**	**1**	**-**	**1**	**1.5**	**1.5**
3 – HIGH, 2 – MEDIUM, 1 – LOW														

PYTHON PROGRAMMING

Class: B.Tech. IV-Semester		**Branch**	**:**	IT
Course Code	**:** **U24IT403**	**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: python programming, operators, control statements & functions in Python

LO2: namespaces, modules, collections, string handling methods & regular expressions in Python

LO3: object oriented programming, inheritance, polymorphism, files & database connectivity using SQLite in Python

LO4: Numpy, Pandas and Matplotlib libraries of Python

THEORY COMPONENT

UNIT-I	9 Hrs

Introduction: Features of Python, The future of Python, Writing and executing Python programs

Python Preliminaries: Literal constants, Variables and identifiers, Data types, 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

Real world applications : Student grading system using control structures and functions

Self Learning Topics (SLTs): *More on Defining Functions (Text1 : chapter 5)*

UNIT-II	9 Hrs

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, Tuple, Sets, Dictionaries

Real world applications : Shopping cart in an e-commerce site, Storing fixed sets of values in GPS coordinates, **Common tags between articles** in a content management system

Self Learning Topics (SLTs): *List comprehension and tuples, Variable-length argument tuples, The zip() function (Text1 : chapter 8)*

UNIT-III	9 Hrs

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 exception 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

Real world applications : Student Management System for collecting and storing student data

Self Learning Topics (SLTs): *Abstract classes and interfaces, Garbage collection (Text1 : chapter 9), Multiple exceptions in a single block, Serialization, Database browser for SQLite (Text1 : chapter 12)*

UNIT-IV	**9 Hrs**

NumPy: The basics of NumPy arrays, Array indexing, Array slicing, Reshaping of array, Concatenation and splitting arrays, Introducing UFuncs

Data Manipulation with Pandas: Installing and using pandas, Introducing pandas objects, data indexing and selection, Handling missing data, Combining datasets, Merge and join, Aggregation and grouping

Visualization with Matplotlib: Importing Matplotlib, Saving figures to files, Simple line plots, Simple scatter plots, Histograms, Binnings and density

Real world applications : Sales Data Analysis System for a Retail Store which includes collecting sales data, cleaning it, analyzing patterns, and visualizing insights

Self Learning Topics (SLTs): *Plotting data on maps (Text2 : topic 4), Python advanced libraries introduction: Scikit-learn, Seaborn, SciPy (Text2 : topic 4)*

LABORATORY COMPONENT

List of Experiments

Experiment-I

1. Installation of Python and verifying PATH environment variable
2. Running instructions in Interactive interpreter and a python script
   (a)Executing instructions in Python Interactive Interpreter
   (b)Running python scripts in Command Prompt
   (c) Running python scripts in IDLE
3. Program to demonstrate importance of indentations. Purposefully raise Indentation Error and correct it
4. Program to take input text as command line argument and display it on screen

Experiment-II

5. Program that takes 2 numbers as command line arguments and prints its sum
6. Program to check whether the given number is even or odd
7. Program to calculate GCD of 2 numbers
8. Program to find Exponentiation (Power) of a number
9. Program to find given year is leap year or not
10. Program to develop a simple calculator

Experiment-III

11. Program to find the Factorial of a given number
12. Program to evaluate the Fibonacci series for a given number 'n'
13. Program to find the Armstrong for a given number
14. Program to find sum of N numbers
15. Program to take a number as input, and print countdown from that number to zero (use while loop)
16. Program to find circulating 'n' values

Experiment-IV

17. Program to implement a module using import statement (Use python source file as a Module and implement import statement another python source files)
18. Program to implement from, import statement
19. Program to implement dir() function
20. Program to demonstrate packages in python

Experiment-V

21. Program to display substring in a string
22. Program to update an existing string
23. Program to implement string concatenation
24. Program to demonstrate string formatting operator

Experiment-VI

25. Program to demonstrate use of slicing in strings
26. Program to compare two strings
27. Program which prints the reverse of a given input string. (use a function with name reverse string and call this function for performing the operation)
28. Program to demonstrate built-in string methods
29. Program to demonstrate list and related functions

Experiment-VII

30. Program to demonstrate tuple, set and related functions
31. Program to demonstrate dictionaries
32. Program to demonstrate Regex functions
33. Program to demonstrate regular expressions using Meta characters

Experiment-VIII

34. Program for the following to demonstrate classes and objects
35. Program to demonstrate class method and static method
36. Program to demonstrate inheritance
37. Program to open and read data from a file
38. Program to write data into a file
39. Program to compute number of characters, words, lines in a file

Experiment-IX

40. Program to install and verify SQLite Connector for Python
41. Program to connect check SQLite Database connectivity
42. Program to retrieve and display data from a table
43. Program to insert data into a table
45. Program to delete rows in a table

Experiment-X
46. Program to install and setup NumPy environment
47. Program to demonstrate NumPy array
48. Program to demonstrate Slice operation
49. Program to demonstrate Reshaping of an array

Experiment-XI
50. Program to demonstrate Installing and using Pandas environment
51. Program to create a series from an ndarray
52. Program to demonstrate indexing and selecting data

Experiment-XII
53. Program to install and setup matplotlib
54. Program to draw a simple line plot
55. Program to draw a histogram plot
56. Program to Customize plots and experiment with different maps plots

Textbook(s):

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

Reference Book(s):

1. Dr. Charles R. Severance, *Python for Everybody-Exploring Data Using Python 3*, 1st ed., USA: Charles Severance, 2016.
2. D. Beazley and B. K. Jones, *Python Cookbook: Recipes for Mastering Python 3*, 3rd ed., USA: O'Reilly Media, 2013
3. Caleb Hattingh, *20 Python Libraries You Aren't Using (But Should)*, 2nd ed., USA: O'Reilly Media, 2016
4. Magnus Lie Hetland, *Beginning: from Novice to Professional*, 1st ed., USA: Apress, 2005

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc23_cs99/ : *NPTEL Video Lecture on Python For Data Science by By Prof. Ragunathan Rengasamy, IIT Madras.*
2. https://onlinecourses.nptel.ac.in/noc25_cs17 : *NPTEL Video Lecture on Data Analytics with Python By Prof. A Ramesh, IIT Roorkee.*
3. 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):

1. *Python Programming Laboratory Manual and Record Book,* Department of IT, 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: develop python programs using syntax, control statements, operators and functions

CO2: develop programs using collections, namespaces, packages, strings and regular expressions

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

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

(based on psychomotor skills acquired from laboratory component)

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

CO6: apply namespaces, packages, string handling methods, regular expressions, lists & dictionaries of Python to develop efficient and effective solutions

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

CO8: examine visualization graphs with Matplotlib and experiment with Numpy & Pandas libraries for data analysis programs in Python

Course Articulation Matrix (CAM):		**U24IT403 PYTHON PROGRAMMING**												
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	**U24IT403.1**	1	1	1	1	2	1	1	1	1	-	2	1	2
CO2	**U24IT403.2**	1	1	1	1	2	1	1	1	1	-	2	2	2
CO3	**U24IT403.3**	2	2	2	2	3	1	1	1	1	-	2	2	2
CO4	**U24IT403.4**	2	2	2	2	3	1	1	1	1	-	2	2	2
CO5	**U24IT403.5**	2	2	2	2	2	1	1	2	1	-	2	2	2
CO6	**U24IT403.6**	2	2	2	2	2	1	1	2	1	-	1	2	2
CO7	**U24IT402.7**	2	2	2	2	3	1	1	2	1	-	2	2	2
CO8	**U24IT403.8**	2	2	2	2	3	1	1	2	1	-	2	2	2
U24IT403		**1.75**	**1.75**	**1.75**	**1.75**	**2.5**	**1**	**1**	**1.5**	**1**	**-**	**1.87**	**1.87**	**2**

OPERATING SYSTEMS

Class: B.Tech. IV –Semester			**Branch**	**:**	IT
Course Code	**:**	**U24IT404**	**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: basics of operating systems, system structure, process concepts

LO2: process scheduling and process synchronization techniques

LO3: deadlocks, memory management, and virtual memory techniques

LO4: file system, implementation of file system and mass storage structure

THEORY COMPONENT

UNIT-I	9 Hrs

Introduction: Operating-system operations, Process management, Memory management, Storage management, Protection and security, Computing environments

Operating System Structures: Operating-system services, System calls: Types of system calls, Operating-system structure, Building and booting an operating System

Processes: Process concept, Process scheduling, Interprocess communication

Real world applications : Case **s**tudy on process scheduling in Window OS/Linux OS

Self Learning Topics (SLTs): *What operating systems do, Computer-system organization(Text1: chapter 1), Threads: Overview, multicore programming, multithreading models (Text1: chapter 4)*

UNIT-II	9 Hrs

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms : First- Come First Served, Shortest-Job-First, Priority, Round-Robin

Synchronization: Background**,** The critical-section problem, Peterson's solution, Hardware support for synchronization, Mutex locks, Semaphores, Monitors

Synchronization Examples: Classic problems of synchronization

Real world applications : Simulation of scheduling algorithms for hospital token management system and synchronization for ATM Transaction Processing

Self Learning Topics (SLTs)*: Multilevel queue, Multilevel feedback queue (Text1: chapter 6)*

UNIT-III	9 Hrs

Deadlocks: System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock Avoidance, Deadlock detection, Recovery from deadlock

Main Memory: Contiguous memory allocation, paging, Structure of page table, Swapping

Virtual Memory: Background, Demand paging, Page replacement, Allocation of frames, Thrashing

Real world applications : Case study on deadlock use cases on banking transaction and memory management in opening a heavy IDE (e.g., Android Studio) along with browser and video calls on a system with limited RAM

***Self Learning Topics (SLTs)**: Structure of page table-Hierarchical paging, Hashed page tables, Inverted page tables. (Text1: chapter 8)*

UNIT-IV	9 Hrs

File System Interface: File concept, Access methods, Directory structure.
File-Systems Implementation: File-system structure, File-system operations, Directory implementation, Allocation methods, Free-space management
Mass-Storage Structure: Overview of mass-storage structure, HDD scheduling, Storage device management, Swap-space management
Real world applications : Case study on directory and file structures on Windows OS / Linux OS

***Self Learning Topics (SLTs)**: Goals of protection, Principle of protection, Domain of protection, Access matrix, Implementation access matrix (Text1: chapter 14)*

LABORATORY COMPONENT

List of Experiments

Experiment -I:

1. Practicing basic UNIX commands:
   a) General Utility Commands
   b) File and directory-related commands

Experiment -II:

2. Data Processing Commands and Communication Commands

Experiment -III:

3. Process Related Commands and Pattern Searching Commands

Experiment -IV:

4. Develop shell programs for the following:
   a) Shell Script Related Commands**:** sh, read, command line arguments ($1), $ @ & $*, set, exit, status ($?), logical operators: ||, &&, exit, if, sleep & wait, case, while & until, for, export, expr commands
   b) Display the details of all users in an order they logged on to system (based on time) who are working on the system
   c) Display the details of all users who are working on the system

Experiment -V:

5. Develop programs for the following**:**
   a) Reading a character and displaying it on the screen
   b) Display the name and class of the student in a separate line
   c) To check if the given two characters are equal or not
   d) Display the given character in its binary form

e) To check if a given number is even or odd

f) Develop a shell script to accept login name as command line argument and find out at how many terminals the user has logged in

Experiment -VI:

6. Develop programs for the following:

a) Develop a shell script which gets executed at login time and displays a blinking message "Good morning/Good Afternoon / Good Evening" depending upon the time at which the user logs in

b) Develop a shell script to check the given character is vowel or not

c) Develop a shell script to perform all basic arithmetic operations using switch statement

d) Develop a menu driven program which has the following options:

i. contents of a given file
ii. list of users who have currently logged in
iii. present working directory
iv. exit

Experiment -VII:

7. **Creative Shell Scripting: From Math Logic to Pattern Magic**

Smart Scripting Assistant for Students:

Imagine you're building a *Smart Terminal Assistant* for students in a college lab that helps them with quick logical and mathematical problems on the fly. This terminal bot should be able to:

1. Predict growth (Fibonacci series like population or startup traction)
2. Verify a security ID (prime number check)
3. Generate pyramid patterns for fun or printing labels

Scenario-Based Problems:

a) Startup Growth Predictor (Fibonacci Series)

Your team is building a terminal-based startup growth simulator. Write a shell script that prints the Fibonacci series, representing the user base growth over N months

User Input: Number of months (terms)

Output Example: 0 1 1 2 3 5 8 13

b) Security ID Validator (Prime Number Check)

In your lab's login system, every student has a unique numeric ID. To validate if a student ID is eligible for secure mode access, write a script to check whether the ID is a prime number.

User Input: ID number

Output Example:

Enter ID: 29
Secure ID. 29 is a prime number.

(OR)

Enter ID: 18
Not a secure ID. 18 is not prime.

c) Pyramid Pattern Printer (Visual Printer Format)

You're developing a command-line label printer. Design a shell script that prints a number pyramid pattern for labels or badges

User Input: Number of rows

Output Example for 5 rows:

1
1 2
1 2 3
1 2 3 4
1 2 3 4 5

Experiment -VIII:

8. Shell Scripting for String Manipulation, Array Processing, and Mathematical Functions.

Automating Student Data Processing in University Systems:

A university's IT department often performs maintenance tasks and data analysis on servers using shell scripts. During semester-end processes, the system administrators need to:

1. Reverse student IDs or usernames for encryption tasks.
2. Analyze student test scores to determine the highest and lowest performers.
3. Calculate the factorial of numbers for mathematical utilities in assignment evaluations.

These repetitive operations are automated using shell scripting.

Scenario-Based Tasks:

a) Reversing a String (e.g., Student ID)

The IT team needs a shell script that takes a student's ID as input and displays it in **reverse order**, which is used in generating temporary access tokens.

Example Input: IT2025001, **Output:** 1005202TI

b) Finding Min and Max from an Array (e.g., Student Scores)

Student scores are stored in arrays. Write a shell script that finds the **minimum and maximum score** from a given array of integers.

Example Input: Scores=(85 91 77 64 92 88)

Output: Minimum: 64, Maximum: 92

c) Factorial Using Function (e.g., Assignment Utility Tool)

In mathematical assignments, factorial calculations are used frequently. Develop a shell script function that computes the **factorial of a given number**.

Example Input: 5

Output: Factorial of 5 is 120

Problem Statement:

Develop the following shell scripts based on the case study:

1. A script to **reverse a given string** (e.g., student ID).
2. A script to find **minimum and maximum** in an array of integers (e.g., student scores).
3. A script containing a **function to compute the factorial** of a given number.

Each script should include:

- Clear user input prompts
- Output formatting
- Input validation (where applicable)

Expected Output Format:

Enter Student ID: B24IT009
Reversed ID: 900TI42B
Enter array of scores: 85 91 77 64 92 88
Minimum Score: 64
Maximum Score: 92
Enter a number: 5
Factorial of 5 is 120

Experiment -IX:

9. Implementation of FCFS and Round Robin CPU Scheduling Algorithms Using a Real-World Scenario.

CPU Scheduling in a Student Project Submission System: During the final week of the semester, students from different departments upload their project files to the university's evaluation server. The server processes each submission by checking formatting, running plagiarism checks, and compiling the submitted code. Since the server can only handle one submission at a time, an efficient CPU scheduling policy is needed.

The arrival and processing times of each student's submission are as follows:

Student (Process ID)	Arrival Time (in ms)	Processing Time / Burst Time (in ms)
Student A (P1)	0	5
Student B (P2)	1	3
Student C (P3)	2	8
Student D (P4)	3	6

For the Round Robin algorithm, use a **time quantum of 4 ms**.

Expected Output:

- Gantt chart showing process execution order
- Table showing waiting time and turnaround time per process
- Average waiting time and average turnaround time

Experiment -X:

10. Implementation of SJF and Priority CPU Scheduling Algorithms Using a Real-Life Scenario.

implement and simulate **Shortest Job First (SJF)** and **Priority Scheduling** CPU algorithms based

on a real-world scenario involving background tasks in a smart home system, and evaluate performance using waiting time and turnaround time.

CPU Scheduling in a Smart Home Control System: In a smart home environment, a central controller (like a smart hub or IoT gateway) receives and processes multiple background tasks triggered by different smart devices such as lights, sensors, appliances, and security systems. Each task has a different execution time depending on its complexity, and some tasks are more urgent (have higher priority) than others.

Given Task Details:

Task (Process ID)	Arrival Time (ms)	Burst Time (ms)	Priority (Lower number = Higher priority)
Light Sensor (P1)	0	6	3
AC Control (P2)	2	8	1
Security Alarm (P3)	4	7	2
Washing Machine (P4)	5	3	4

Implement Shortest Job First (SJF) Non-Preemptive Scheduling for the above scenario and compute:

- Gantt chart
- Waiting time for each process
- Turnaround time for each process
- Average waiting time
- Average turnaround time

Implement Priority Scheduling (Non-Preemptive), where lower number indicates higher priority, and compute the same parameters.

Expected Output:

- Gantt chart showing execution sequence
- Table showing individual and average waiting & turnaround times
- Comparative analysis (optional) between SJF and Priority Scheduling based on results

Experiment -XI:

11. Implementation of Banker's Algorithm for Deadlock Avoidance Using a Real-World Resource Allocation Scenario.

Resource Allocation in a University Cloud Lab: In a university's cloud-based lab setup, several student groups are working on cloud simulations. Each group (process) needs different types of cloud resources—like VMs (Virtual Machines), storage units, and network bandwidth—to complete their experiments.

To ensure that no group causes the system to enter a deadlock (by requesting more resources than available), the cloud controller uses the Banker's Algorithm to

decide whether to grant or deny resource requests based on current system state.

System Details:
There are 5 processes (P0 to P4) and 3 resource types (A, B, C)

1. Allocation Matrix:

Process	A	B	C
P0	0	1	0
P1	2	0	0
P2	3	0	2
P3	2	1	1
P4	0	0	2

2. Maximum Matrix:

Process	A	B	C
P0	7	5	3
P1	3	2	2
P2	9	0	2
P3	2	2	2
P4	4	3	3

3. Available Resources:

A	B	C
3	3	2

- Implement the Banker's Algorithm for the given system configuration.
- Determine if the current state of the system is safe or unsafe.
- If safe, display the safe sequence of process execution.
- Allow students to simulate a new resource request by any process and decide whether it should be granted or denied, based on the algorithm.

Expected Output:

- Safe/Unsafe state message
- Safe sequence (if safe)
- Decision on resource request validity
- Step-by-step explanation of how the system decides each allocation

Experiment -XII:

12. Implementation of FIFO and LRU Page Replacement Algorithms Using a Real-World Memory Management Scenario.
    Memory Management in a University Computer System: In a university's shared

computer lab, several students use lab systems to run multiple applications such as code editors, browsers, IDEs, and document processors. Each of these applications requests memory pages to be loaded into RAM for execution.

However, the system has limited memory frames, so whenever a new page is requested and the memory is full, the system must decide which page to replace. The operating system uses Page Replacement Algorithms like FIFO and LRU to make this decision.

Given Input:

- **Reference String (Page Requests):**
  7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2
- **Number of Frames:** 3
- Implement the **FIFO Page Replacement Algorithm** using the above reference string.
- Implement the **LRU Page Replacement Algorithm** using the same data.
- For each algorithm:
  - Display the memory state after each page request.
  - Count and display the **number of page faults**.
  - Display the **final state of memory**.

Expected Output:

- Step-by-step memory status after each request
- Total number of page faults
- Comparison of FIFO and LRU in terms of efficiency

Textbook(s):

1. A. Silberschatz, P. B. Galvin, and G. Gagne, *Operating System Concepts*, 10th ed., USA: Wiley, 2016.

Reference Book(s):

1. Ekta Walia, *Operating Systems*, 2nd ed., New Delhi, India: Khanna Publishing House, 2019
2. D. M. Dhamdhere, *Operating Systems: A Concept-Based Approach*, 2nd ed. New Delhi, India: McGraw Hill Education, 2006
3. William Stalling, *Operating Systems*, 1st ed., USA : Maxwell, McMillan International Editions, 1992

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc20_cs04/preview; *NPTEL Video Lecture: Operating Systems by Prof. Sorav Bansal, IIT Delhi*

Laboratory Manual (for laboratory component):

1. *Operating Systems Laboratory Manual and Record Book,* Department of IT, KITSW

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: apply operating system functions including process, memory, and storage management in various computing environments

CO2: analyze process scheduling algorithms and synchronization mechanisms to solve real world problems

CO3: apply deadlock handling methods and memory management strategies including paging and segmentation to improve system performance

CO4: analyze file system structures, disk scheduling algorithms, and protection mechanisms to determine their impact on system efficiency

(based on psychomotor skills acquired from laboratory component)

CO5: apply UNIX commands to manage files, processes, and system operations effectively

CO6: apply shell programming to develop scripts for automating system tasks and solving real-time problems

CO7: develop various CPU scheduling algorithms and apply Banker's algorithm to handle deadlocks

CO8: develop page replacement algorithms and analyze their performance in virtual memory management scenarios

Course Articulation Matrix (CAM):		**U24IT404 OPERATING SYSTEMS**												
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	**U24IT404.1**	2	1	2	1	-	-	-	-	-	-	1	2	1
CO2	**U24IT404.2**	2	1	2	2	-	-	-	-	-	-	1	2	1
CO3	**U24IT404.3**	2	1	2	2	-	-	-	-	-	-	1	2	1
CO4	**U24IT404.4**	2	1	2	1	-	-	-	-	-	-	1	2	1
CO5	**U24IT404.5**	2	1	1	1	1	1	1	-	-	-	1	2	1
CO6	**U24IT404.6**	2	1	2	1	1	1	1	-	-	-	1	2	1
CO7	**U24IT404.7**	2	1	2	1	1	1	1	-	-	-	1	2	1
CO8	**U24IT404.8**	2	1	2	1	1	1	1	-	-	-	1	2	1
U24IT404		**2**	**1**	**1.87**	**1.33**	**1**	**1**	**1**	**-**	**-**	**-**	**1**	**2**	**1**
3 - HIGH, 2 - MEDIUM, 1 - LOW														

COMPUTER NETWORKS

Class: B.Tech. IV -Semester		**Branch**	**:**	IT
Course Code:	**U24IT405**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E):	**2-1-0-4-7**	**CIE**	**:**	**60%**
Total Number of Teaching Hours:	**36 Hrs**	**ESE**	**:**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: network topologies, network reference models, physical layer, media types & switching techniques

LO2: digital transmission, data link layer concepts, error detection & correction techniques and Ethernet technology

LO3: principles and design issues of network layer, Internet protocols & routing techniques and Ethernet technology

LO4: transport layer design issues, protocols & application layer services

UNIT-I	**9 Hrs**

Introduction: Data Communications, Networks, Network types, TCP/IP protocol suite, The OSI model

Physical Layer: Introduction, Data and Signals, Periodic analog signals, Digital signals, Transmission impairment, Performance, Guided Media, Unguided media: Wireless

Switching: Circuit switched networks and Packet switching

Real world applications : Traditional telephone network and LAN with multiple PCs

Self Learning Topics (SLTs): *Network types (Text1: topics 1.3), Practice problems (Text1: Prob 1.7.3)*

UNIT-II	**9 Hrs**

Digital Transmission: Digital to digital conversation

Analog Transmission: Digital to analog conversion

Data Link Layer: Link layer addressing

Error Detection and Correction: Introduction, Block coding, Cyclic codes, Forward error correction

Data Link Control(DLC): DLC Services, Data link layer protocols : Simple Protocol, Stop-and-Wait Protocol, Piggybacking

Real world applications : Digital data transmission in Ethernet cable/USB devices and MAC addresses for identifying devices on a local network

Self Learning Topics (SLTs): *Data Link Layer: Introduction (Text1: topics: 9.1), Practice problems (Text1: Prob 10.7.3)*

UNIT-III	**9 Hrs**

Wired LAN: Ethernet protocol, Standard ethernet, Fast ethernet, Gigabit ethernet

Medium Access Control(MAC): Random access and channelization

Network Layer: Network layer performance, IPv4 addresses

Next Generation IP: IPv6 addressing, The IPv6 protocol, ICMPv6 protocol

Real world applications : Case study on IP configuration and Ethernet connections in any computer lab

Self Learning Topics (SLTs): *Network Layer: Services (Text1: topics 18.1), Practice problems (Text1: Prob 20.5.3)*

UNIT-IV	9 Hrs

Unicast Routing: Routing algorithms, Unicast routing protocols

Multicast Routing: Introduction, Multicasting basics, Intra – inter domain multicast protocols

Transport-Layer: Introduction, Transport layer protocols, User datagram protocol, Transmission control protocol

Application Layer: Introduction, Application layer protocols : HTTP, FTP, Electronic mail, Telnet, Domain Name System (DNS), Client server programming

Wireless Networks: Introduction

Real world applications : Interconnecting computers, switches, and routers within buildings or campuses and Email communication protocols

Self Learning Topics (SLTs): World Wide Web (WWW) (Text1: topics 26.1), Secure Shell (SSH) (Text1: topics 26.5)

Textbook:

1. Behrouz A.Forouzan, *Data Communications and Networking*, 5th ed., New Delhi, India: McGraw-Hill Education (India), 2017

Reference Book(s):

1. A. S. Tanenbaum and D. J. Wetherall, *Computer Networks*, 5th ed., New Delhi, India: Pearson Education, 2016.
2. W. Stallings, *Data and Computer Communications*, 10th ed., New Delhi, India: Pearson Education, 2014

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc25_cs15/preview; *NPTEL Video Lecture on Computer Networks by Prof. Soumya Kanti Ghosh, Prof. Sandip Chakraborty, IIT Kharagpur*

Course Learning Outcomes (COs):

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

CO1: apply the principles of data communication, including the OSI model and TCP/IP protocol suite, to design and implement network systems, and utilize switching techniques to optimize data transmission across guided and unguided media

CO2: apply digital and analog transmission techniques to convert and transmit data, implement error detection and correction methods (block coding, cyclic codes), and utilize data link layer protocols to ensure reliable communication between devices

CO3: analyze the performance and scalability of various Ethernet protocols (Standard, Fast, Gigabit) and MAC mechanisms, and evaluate the impact of IPv4 and IPv6 addressing on network layer efficiency and next-generation IP protocol implementation.

CO4: apply routing algorithms and protocols to configure unicast and multicast routing, implement transport layer protocols like UDP and TCP, and develop client-server applications using application layer protocols such as HTTP, FTP, and DNS to

facilitate efficient communication.

Course Articulation Matrix (CAM):		U24IT405 COMPUTER NETWORKS												
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	U24IT405.1	3	2	1	-	-	1	-	-	1	-	1	2	1
CO2	U24IT405.2	3	2	2	-	-	1	-	-	1	-	1	2	1
CO3	U24IT405.3	2	2	1	-	-	1	-	-	1	-	1	2	1
CO4	U24IT405.4	3	1	1	-	-	1	-	-	1	-	1	2	1
U24IT405		**2.75**	**1.75**	**1.25**	**-**	**-**	**1**	**-**	**-**	**1**	**-**	**1**	**2**	**1**
3 - HIGH, 2 - MEDIUM, 1 - LOW														

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:	**24 Hrs**	**ESE**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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	**6 Hrs**

Quantitative Aptitude-I: Number system, Averages, Percentages, Ratios & proportions, Time, Speed & distance, Time and work

UNIT-II	**6 Hrs**

Quantitative Aptitude-II: Simple interest, Compound interest, Profit & loss, Ages, Permutations & Combinations, Probability

UNIT-III	**6 Hrs**

Logical Reasoning-I: Series completion, Analogy, Coding and decoding, Blood relations, Number, Ranking & Time sequence test, Linear & Circular arrangements

UNIT-IV	**6 Hrs**

Logical Reasoning-II: Data sufficiency, Logical Venn diagram, Syllogisms, Statement & Arguments, Statement & Assumptions, Direction sense test

Note: Students should go through the QALR course supplementary material made available on online learning platform

- *Contents covered in class shall be practiced through the material available on the online learning platform. At home practice problems and practice tests shall be made available on the online learning platform*
- *Tutorial classes shall be conducted on the online learning platform and hence students shall attend the tutorial classes with laptop/tab*
- *All assessments shall be conducted through online learning platform*

Textbook(s):

1. **R S Agarwal**, *Quantitative Aptitude for Competitive Examinations*, 3rd ed., New Delhi: S. Chand Publications, 2019. *(Chapters 1,6,7,8,10,11,12,15,17,21,22,30,31 - for Unit I & II)*

2. **R S Agarwal**, *A Modern Approach to Verbal and Non-Verbal Reasoning*, 3rd ed., New Delhi: S. Chand Publications, 2019. *(Chapters Section I: 1,3,4,5,6,8,16, Section II: 2,3 - for Unit III & IV)*

Reference Book(s):

1. **Dinesh Khattar**, *Quantitative Aptitude for Competitive Examinations*, 1st ed., New Delhi: Pearson India, 2019.
2. **Nishit K Sinha**, *Reasoning for Competitive Examinations*, 1 st ed., New Delhi: Pearson India, 2019.
3. **R. N. Thakur**, *General Intelligence and Reasoning*, 1st ed., New Delhi: McGraw Hill Education, 2017.

Course Learning Outcomes (COs):

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

CO1: apply arithmetic concepts such as averages, percentages, ratios, and time-based calculations to solve real-life quantitative problems

CO2: analyze and solve problems involving financial, arithmetic and probability using structured quantitative methods

CO3: identify patterns and apply deductive reasoning to solve series, coding-decoding, and arrangement-based logical problems

CO4: evaluate logical statements, assess validity, and draw conclusions using tools like syllogisms, Venn diagrams, and argument analysis

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

Programming Skill Development Lab - 3

Class: B.Tech. IV -Semester		**Branch:** IT	
Course Code:	**U24SE407**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-2-2-4**	**CIE :**	**100%**
Total Number of Lab Hours:	**36 Hrs**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on…

LO1: basic java implementation that demonstrates the use of data types, type casting, arrays, and class concepts
LO2: classes, methods and strings
LO3: types of inheritance, dynamic method dispatch, interface and packages
LO4: streams (I/O), exception handling and mutli-threading

LABORATORY COMPONENT

S. No.	List of Experiments
1.	a) Develop a Java program using a class named Arithmetic. Read two numbers from the command line arguments and perform all basic arithmetic operations: addition, subtraction, multiplication, division, and modulus. Use separate methods for each operation: add() for addition, sub() for subtraction, mul() for multiplication, div() for division, mod() for modulus. b) Develop a Java program using a class named Matrix to perform the multiplication of two matrices. The matrix values should be read from the keyboard. The program should: i. Read two matrices (of user-defined size) from the keyboard. ii. In the Matrix class, implement a method mul() to multiply two matrices. iii. Before performing multiplication, check whether the multiplication condition is satisfied (i.e., the number of columns in the first matrix must be equal to the number of rows in the second matrix). iv. If the condition is satisfied, compute and display the product of the two matrices. v. Otherwise, display a message indicating that matrix multiplication is not possible with the given matrix dimensions. c) Develop a Java program to demonstrate wrapper class by read five numbers using command line arguments and print the prime numbers from the given numbers.

2.	a) Develop a Java program to recursively linearly search an element in an array. b) Develop a Java program to interchange elements of first and last in a matrix across rows and interchange elements of first and last in a matrix across columns. **Note:** Read the first matrix from user input for the second program take the first program output as input. c) Develop a Java program to implement a seating reservation system using a 2D array in Java. **Hint:** A cinema hall has a fixed number of rows and columns of seats. A 5x5 array represents the seating arrangement (1 for booked, 0 for available). Users can select seats, and the program should update availability.
3.	a) Develop a Java program to determine whether two strings are anagram or not. b) Develop a Java program to simulate an ATM Application. The application should include the following functionalities: like 1) Withdraw 2) Deposit 3) Check balance 4) Exit. The program should allow the user to choose an option from a menu and perform the corresponding operation. Proper validations (like checking for sufficient balance during withdrawal) should be implemented
4.	a) Develop a Java program to find all the permutations of a string. Hint: Permutations of "abc" : abc acb bac bca cab cba b) Develop a Java program to find the largest and smallest word in a string based on the length of the word. c) Develop a Java program to find the duplicate words in a string.
5.	a) Develop a Java function to split the string using a string tokenizer using following scenario. A CSV file contains the following line: "John,Doe,35,New York, Software Engineer" You need to extract and print: First Name Last Name Age City Job Title. b) Develop a Java program based on following scenario. A user types "I love Java" but wants to insert "programming" between "love" and "Java", making it: "I love programming Java".

6.	a) Develop a Java program that design a class Employee with multiple ways to initialize it. One constructor takes an employee ID and name, while another takes an employee ID, name, and salary. Based on above data implement constructor overloading in Java. b) Develop a Java program by writing an overridden getNumberOfTeamMembers method that prints the same statement as the super class getNumberOfTeamMembers method, except that it replaces with (the number of players on a Soccer team). *Output Format* When executed, your completed code should print the following: Generic Sports Each team has n players in Generic Sports Soccer Class Each team has 11 players in Soccer Class	
7.	a) **Develop a Java program** that a bank has different types of accounts. A Savings Account is a specialized type of **Bank Account** that has additional features like interest calculation. We implement this scenario using single inheritance where SavingsAccount inherits from Bank Account. **Hint:** Bank Account (Parent Class): Holds account details and common operations (deposit, withdraw, display Account Details). Savings Account (Child Class, Single Inheritance): Inherits Bank Account properties and methods. Adds a new method addInterest() to calculate interest. Main Class (Bank Application): Creates a Savings Account object, performs operations, and displays details b) Develop a Java program that design a payment gateway system that supports multiple payment methods such as Credit Card and UPI. Define an interface Payment with a method processPayment(double amount). Implement two classes: **CreditCardPayment** that implements processPayment() and displays "Processing credit card payment of $" + amount. **UPIPayment** that implements processPayment() and displays "Processing UPI payment of $" + amount. In the main() method, accept a payment method and amount from the user and process the payment accordingly.	

8.	a) Develop a java program to demonstrate on a hierarchy of classes representing different types of animals: Animal, Dog, and Cat. Animal has a method called makeSound(). Dog and Cat override this method to provide their specific sounds. b) Develop a java program to demonstrate the scenario which involves implementing a Notification System where different services (Email, SMS, Push) send messages using a common interface, Notifier, with the method void send(String message), and a method that accepts any Notifier to send a notification. c) Develop a java program to demonstrate the scenario demonstrates the Strategy Pattern using interfaces by defining a SortStrategy interface with a void sort(int[] arr) method, and implementing different sorting algorithms like BubbleSort, QuickSort, and MergeSort, allowing the user to choose and apply a sorting strategy at runtime.
9.	a) Develop a java program based on the following scenario You are working on an e-commerce website where an order processing system runs in the background while users continue shopping. How will you ensure the background process does not affect user experience? **Hint:** Use ScheduledExecutorService for this task. b) Develop a java program to demonstrate the scenario involves building a modularized Library Management System in Java by organizing the application into packages—library.books, library.users, and library.transactions—each containing relevant classes like Book, User, and IssueTransaction, with a Main class in the library.main package to manage the overall system.
10.	a) Develop a java program based on the scenario 'Payment Gateway Exception Handling' that you are integrating a payment gateway for an e-commerce website. Sometimes, payments fail due to network issues or incorrect card details. How will you handle these exceptions gracefully? Write code for failed transactions. Write code for the users are notified properly. b) Develop a java program demonstrate on 'you are tasked with creating a program that processes two numbers input by the user prompt the user has to enter two numbers: numerator and denominator and validate the inputs like if the user enters non-numeric values, the program should handle it gracefully and Perform the division and display the result. Handle the following exceptions: InputMismatchException if non-integer values are entered.

	ArithmeticException if the denominator is zero. Any other Exception that might occur unexpectedly.
11.	a) Develop a java program based on the following scenario Reading from a File You are developing a program that reads a list of students' names from a file called students.txt and displays them on the console. How would you handle file reading exceptions? What happens if the file does not exist? b) Develop a java program based on the following scenario Scenario: Student Management System you can create a package called student containing a Student class, and another package main containing the Main class to use the Student class.
12.	a) Develop a java program based on the following **Scenario**: Implementing a Producer-Consumer System **Problem Statement:** You are tasked with implementing a producer-consumer system where multiple producer threads generate data and place it into a shared buffer, and multiple consumer threads process the data from the buffer. The system should ensure that the buffer has a fixed size and can hold a limited number of items,producers should wait if the buffer is full, consumers should wait if the buffer is empty and the system should handle synchronization to prevent race conditions. **b)** Develop a java program based on the following **scenario:** Managing a Shared Resource **Problem Statement:** You are tasked with implementing a system where multiple threads represent users accessing a shared printer. The printer can only handle one user at a time, and each user requires a random amount of time to print a document. Your goal is to ensure that only one user can access the printer at any given time, users should wait if the printer is currently in use and once a user finishes printing, another waiting user should be allowed to use the printer.

Text Book(s):

1. Herbert Schildt, *Java The Complete Reference*, 13th ed., New Delhi: McGraw-Hill Education, 2019.
2. Harvey Deitel, Paul J. Deitel, *Java How to Program,* 11th ed., New Delhi: Pearson Publications, 2018.
3. KathySierra, BertBates, *Head First Java*, 2nd ed., Boston: O'Reilly Publications, 2005.

Reference Book(s):

1. Uttam K. Roy, *Advanced JAVA Programming*, 1st ed., England: Oxford Publications,2013
2. Balaguruswamy, *Programming with Java: A Primer*, 7th ed., New Delhi: McGraw-Hill Education India Pvt. Ltd., 2019.
3. TanweerAlam, *Internet and Java Programming*, 1st ed., New Delhi: Khanna Publishing House, 2010.

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 and test various java programming paradigms and java fundamental programs

CO2: develop and test java programs using classes, constructors and various string concepts

CO3: analyze how reusability concepts such as inheritance, interfaces, and packages are utilized in building efficient, maintainable java programs

CO4: develop and test java programs using streams (Input/Output), exception handling and multithreading concepts

Course Articulation Matrix (CAM):		**U24SE407 : PROGRAMMING SKILL DEVELOPMENT LAB-3**												
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	**U24SE407.1**	2	2	1	1	1	-	1	1	1	1	1	2	2
CO2	**U24SE407.2**	2	2	1	1	1	-	1	1	1	1	1	2	2
CO3	**U24SE407.3**	2	2	1	1	1	-	1	1	1	1	1	2	2
CO4	**U24SE407.4**	2	2	1	1	1	-	1	1	1	1	1	2	2
U24SE407		**2**	**2**	**1**	**1**	**1**	**-**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

PRACTICUM

Class: B.Tech. IV -Semester			**Branch**	**:**	Common to all branches
Course Code	**:**	**U24EL408**	**Credits**	**:**	**1**
Hours/Week (L-T-P-O-E)	**:**	**0-0-0-4-4**	**CIE**	**:**	**100 %**
Total Number of Teaching Hours	**:**	**-**	**ESE**	**:**	

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps
LO2: implementing a project independently by applying knowledge to practice
LO3: preparing well-documented report and informative PPT
LO4: effective technical presentation and creating video pitch

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

(i) Practicum is a mandatory semester project work.
(ii) Practicum is offered as a one credit course. Student has to earn 4 credits (one in each semester from I to IV semesters)
(iii) Allotment of Practicum topics for students:

- **Practicum matrix:** In week (-1), the class teacher, in consultation with HoD, shall prepare the practicum matrix of the section. The practicum matrix is the allotment of group of students to the different course faculty of the section, as shown below.

Course	U24IT401	U24IT402	U24IT403	U24IT404	U24IT405
Students allotted to different courses	B24IT001	B24IT014	B24IT027	B24IT040	B24IT053
	B24IT002	B24IT015	B24IT028	B24IT041	B24IT054
	B24IT003	B24IT016	B24IT029	B24IT042	B24IT055
	B24IT004	B24IT017	B24IT030	B24IT043	B24IT056
	B24IT005	B24IT018	B24IT031	B24IT044	B24IT057
	B24IT006	B24IT019	B24IT032	B24IT045	B24IT058
	B24IT007	B24IT020	B24IT033	B24IT046	B24IT059
	B24IT008	B24IT021	B24IT034	B24IT047	B24IT060
	B24IT009	B24IT022	B24IT035	B24IT048	B24IT061
	B24IT010	B24IT023	B24IT036	B24IT049	B24IT062
	B24IT011	B24IT024	B24IT037	B24IT050	B24IT063
	B24IT012	B24IT025	B24IT038	B24IT051	B24IT064
	B24IT013	B24IT026	B24IT039	B24IT052	

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

1. The students should meet immediately the allotted course faculty for practicum and start working on the practicum with the guidance of course faculty.
2. To complete the Practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the class work time table 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)

****

(i) ***To complete the practicum, the student shall work in laboratories under supervision of allotted course faculty, in the allotted hours in the class work timetable and outside the class work hours during weekdays.***

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

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

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

(v) 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

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

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

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

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

(b) **Working Model**: Each student is required to develop a prototype / process / system/simulation model on the given practicum topic and demonstrate/present, during the allotted time, before the course teacher.

(c) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.

- What was the objective of the practicum assigned?
- What are the main responsibilities and tasks for practicum?
- What knowledge and skills from the coursework are applied in the practicum?
- What new knowledge and skills are acquired during the practicum?
- In what ways, can the practicum be helpful for the professional career?
- What gaps are identified in your practicum work?
- What improvements or changes you suggest for addressing the identified gaps for future work?

(d) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the course teacher as per the schedule notified by the department

(f) **Video Pitch:** Each student should create a pitch video, which is a video presentation on his / her Practicum. Video pitch should be no longer than 5 minutes by keeping the pitch concise and to the point, which shall also include evidence like videos & pics at the time of implementing the practicum and also key points about his / her business idea / plan (*if any*) and social impact

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

iv) he/she is absent for oral presentation and viva-voce

v) he/she fails to submit the report in prescribed format

vi) he/she fails to fulfill the requirements of Practicum evaluation as per specified guidelines

Course Learning Outcomes (COs):

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

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

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

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

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

Course Articulation Matrix (CAM):		**U24EL408 PRACTICUM**											
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	**U24EL408.1**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO2	**U24EL408.2**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO3	**U24EL408.3**	2	2	2	2	2	2	2	2	2	2	2	2	2
CO4	**U24EL408.4**	2	2	2	2	2	2	2	2	2	2	2	2	2
U24EL408		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

Course code U24ELXYY: ***X represents semester, YY represents ETA course serial number***

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA /SAA)			
Class: B.Tech. IV Semesters		**Branch :** Common to all branches	
Course Code :	**U24VA409(SE/SA)ZZZ**	**Credits :**	**1**
Hours/Week (L-T-P-O-E) :	**0-0-0-2-2**	**CIE :**	**100%**
Total Number of Teaching Hours :	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

- **LO1 :** holistic development through activity-based learning to gain real-life experience which effectively help individuals deal appropriately with problems/challenges
- **LO2 :** positive mindset by actively adopting optimism, acceptance, resilience, gratitude, mindfulness, and integrity and handling rejection in life
- **LO3 :** skills for effective fieldwork practice, which include ethics, observation, communication, interviewing, problem solving, time management, organization and documentation
- **LO4 :** making a well-documented report and an effective oral presentation through PPTs portraying knowledge, skills, qualities acquired and social impact of the activity

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

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

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

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

- Students have to identify goals, acquire and accumulate knowledge on the chosen SEA/SAA activity
- For the activities related to social awareness/issues/challenges that affect society, use the knowledge base, apply relevant skills to analyze 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
- For the activities related to physical fitness, music, dance, fine arts, etc., guided practice sessions under supervision of expert/guru are to be planned and executed to acquire the benchmark skills to be demonstrated

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

- 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
- Fieldwork consists of three phases: preparation, the actual activity and feedback
- **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**
- 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
- Certain skills are required for effective fieldwork, which include observation, communication, interviewing, problem solving, documentation, and more
- 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
- **Eminent personalities/achievers/renowned persons/inspiring and great personalities**

Eminent personalities/ Achievers / Renowned personalities:

(a) **In case of socially relevant problems/ activities of SEA/SAA: E**minent 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.

- **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
- On fieldwork, student is expected to demonstrate solid time management, organizational and note taking skills during fieldwork

- **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
- Student is expected to take care of health and Safety practices for fieldwork and travel
- 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.
- 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 & practice sessions, if any) shall be appended as annexures in the report to be submitted for course evaluation.
- **Feedback:** The learning, the student made out of interaction with eminent achievers shall be presented in the report as one of the chapters.
    - During feedback, the central focus is on the elaboration of the students' experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentation and report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.

(c) **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 counselor for award of grade.

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

- ***Faculty counselor approval***: In week (-1), in consultation with faculty counselor, every student shall, identifies minimum of4 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
- ***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.
- ***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 counselor and the nodal centre.
- ***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.

- ***Report writing:*** After successful demonstration/presentation, student shall write a 2–3-page report and submit the same to the faculty counselor. 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.

(e) ***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 counselors, consolidate them, and submit the final grades to the examination branch, within one week of the last day of instruction. Evaluation of SEA/SAA activities shall be completed as and when students are ready, but not later than week (N+1).

The CIE for SEA/SAA is as follows:

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

Note:

(f) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

- The necessary arrangements for demonstration shall be looked after the student in consultation with the coordinator with due permission from Head of the department.

(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 semeers.
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**: analyze the issues related to social empowerment / self-accomplishment, demonstrate problem-solving skills, articulate solutions and demonstrate social sensibility **CO4**: demonstrate the generic competencies in making a well-documented report and an effective oral presentation with PPTs portraying knowledge, skills, qualities acquired through fieldwork/practice sessions and social impact of the course learning
Text / Reference book(s): *For knowledge acquisition, students shall refer to textbooks and web resources relevant to the course selected. Plan for fieldwork/practice sessions in coordination with SEA/SAA coordinator*

Course Code: **U24VA XYY(SE/SA)ZZZ**

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

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

EXPERT TALK SERIES			
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**	**CIE :**	**100 %**
Total Number of Teaching Hours:	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

(q) You need to be aware of the real-world problems, industry working style, need to be confident and smart and you also need to know the tricks of the trade.

(r) Learning from industry experts with real-world examples, is important to enhance your educational experience.

(s) Enhanced graduate employability benefits all stakeholders. To effectively enhance employability and the immediacy of adding value to company/project, it is important that you are aware of what you are learning and its use in the workplace. The cognitive abilities viz., remember, understand, recall, and application of knowledge and other skills acquired in higher education can be maximized if you are clear on the purpose of your developed competencies and how to apply them in a range of complex situations.

(t) Graduate employability could be enhanced through fostering lifelong learning, the development of a range of employability-related competencies and increased confidence and capacity in "reflecting on and articulating these capabilities and attributes in a range of recruitment situations".

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

(u) The answer is Industry **Expert Talk Series (ETS)**.Through ETS, we invite industry experts in different fields to deliver talks and interact with students.

(v) Through Industry expert talks students get to know so much more that textbooks don't explain.

(w) Students have the opportunity to learn from professionals who have achieved success in their respective fields. These speakers often share their personal experiences, case studies, and anecdotes, providing students with real-world examples and perspectives that go beyond theoretical concepts.

(x) Our competency-focused curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses

(y) ETS helps students gain improved industry engagement for an easier transition into the workplace, broader career progression opportunities and personal development.

(z) In URR24 curriculum, Expert talk series (ETS) is offered as a course under **ability**

enhancement category of courses.

(aa) Through ETS sessions, students get the chance to interact with industry regularly which helps them focus on the needs and requirements of current industry. This will not only enthuse the students with new ideas but also motivate them to understand what kind of 21st century skills are needed in industry and how they need to groom themselves.

(bb) Through ETS sessions, another benefit is that students learn the importance of soft skills like communication, presentation, email etiquettes, corporate grooming and dressing styles. Conversing with successful people is the biggest motivation and students gain in more ways than one through ETS sessions.

(cc) ETS enhances your learning in many ways for global opportunities for your career.

(dd) All in all, learning from industry experts**,** is a wonderful opportunity for student to getting acquainted with professional etiquette, acquiring professional knowledge, and getting to know the internal workings of an organization.

(ee) Salient features of ETS are hereunder:

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

(ff) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

i. **Attendance**: Maximum of 20 marks shall be awarded based on the attendance maintained

by the student over a maximum of 10 lectures.

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

ii. Supplementary Exam:

(e) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE

(f) The ETS supplementary examination shall be conducted by the parent department, in physical mode, for 100 marks(MCQs/FiBs ; *duration: 2Hrs*)on the content covered in ETS lectures.

(g) Department ETS coordinator shall, in coordination with the institute level ETS coordinator, conduct the supplementary exam, and submit scores to the CoE

(h) Exam material/resources for supplementary: Recorded videos of ETS arranged for that semester, which shall be made available on ETS webpage of institute website

Course Learning Outcomes (COs):

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

CO1: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO2: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

CO3: interact with experts, exhibit confidence, demonstrate improved communication and networking abilities potentially leading to mentorship opportunities, internships, or even future job prospects

CO4: demonstrate the generic competencies in making a well-documented report portraying knowledge, skills, qualities acquired through ETS sessions and impact of the expert talks

Course Articulation Matrix (CAM):		**U24AE410 EXPERT TALK SERIES**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO 2**
CO1	**U24AE410.1**	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	**U24AE410.2**	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	**U24AE410.3**	1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	**U24AE410.4**	1	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE410		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW															

Course code U24AEXYY: ***X represents semester, YY represents ETA course serial number***

ENVIRONMENTAL STUDIES

Class: B.Tech. IV Semester			Branch :	IT
Course Code	**:**	**U24CY411**	**Credits :**	**-**
Hours/Week (L-T-P-O-E)	**:**	**2-0-0-5-7**	**CIE :**	**60 %**
Total Number of Teaching Hours :		**24 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: natural resources and their usage more equitably

LO2: ecosystem and the importance of biodiversity conservation

LO3: environmental pollution and it's control measures

LO4: environmental legislation and green methodology

UNIT-I	**6 Hrs**

The Multidisciplinary Nature of Environmental Studies: Definition, Scope and importance

Natural Resources: Forest Resources-Use and over exploitation of forests, Deforestation, Timber extraction, Mining, Dams and their effects on forests and tribal people**;** Water Resources-Use and over-utilization of surface and ground water, Floods, Drought, Conflicts over water**;** Mineral Resources-Environmental effects of extracting and using mineral resources**;** Energy Resources-Renewable and non-renewable energy sources, Use of alternate energy sources

Self Learning Topics (SLTs): *Use and over-utilization of surface and ground water (Text1: topic 2.2.2), world food problems (Text1: topic 2.2.2)*

UNIT-II	**6 Hrs**

Ecosystem and Biodiversity:

Ecosystem: Concepts of an ecosystem, Food chain, Food webs, Ecological pyramids, Energy flow in the ecosystem and ecological succession

Biodiversity and its Conservation: Introduction, Definition, Genetic, Species and ecosystem diversity, Value of biodiversity, Biodiversity in India, Hot spots of biodiversity, Man-wildlife conflicts, Endangered and endemic species of India; In-situ and Ex-situ conservation

Self Learning Topics (SLTs): *Introduction and definition of biodiversity (Text1: topic 4.1)*

UNIT-III	**6 Hrs**

Environmental Pollution: Global issues **-** Global climatic change, Greenhouse gases, Effects of global warming, Ozone layer depletion

International Conventions / Protocols: Earth summit, Kyoto protocol, Montreal protocol

Environmental Pollution : Causes and effects of air, Water, Soil, Marine and noise pollution with case studies

Solid and Hazardous Waste Management: Introduction, Types, Effects of urban industrial and nuclear waste

Natural Disaster Management: Introduction to disaster, Management of disaster, Disaster management of flood, earthquake, cyclone and landslides

Role of information technology in environment and human health

Self Learning Topics (SLTs): *Role of individual in prevention of pollution (Text1: topic 5.10)*

UNIT-IV	6 Hrs

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

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

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

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

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

Textbook(s):

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

Reference Book(s):

1. Y. Anjaneyulu, *Introduction to Environmental Science*, 1st ed. Hyderabad, India: B.S. Publications, 2004
2. Gilbert M. Masters and W. P. Ela, *Introduction to Environmental Engineering & Science*, 3rd ed., USA: Prentice Hall, 2008
3. Anubha Kaushik, C.P. Kaushik, *Environmental Studies*, 4th ed., New Delhi, India : New Age International Publishers, 2014
4. R. Rajagopalan, *Environmental Studies from crisis to cure*, 2nd ed., New Delhi, India : Oxford University Press, 2011

Web and Video link(s):

1. *https://archive.nptel.ac.in/noc/courses/noc22/SEM1/noc22-ch27/ : video lecture on renewable energy resources by Prof. Vaibhav. V. Goud and Dr. R. Anandalakshmi, Dept. of Chemical Engineering, Guwahati.*
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 students should be able to,

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

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

CO3: examine and perceive the solutions for the environmental pollution

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

Course Articulation Matrix (CAM):		U24CY411 ENVIRONMENTAL STUDIES												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	U24CY411.1	2	1	2	1	-	2	1	1	1	-	-	-	-
CO2	U24CY411.2	-	-	2	-	-	1	1	1	1	1	-	-	-
CO3	U24CY411.3	1	2	1	-	-	1	1	1	1	1	1	-	-
CO4	U24CY411.4	-	-	1	-	-	1	1	1	1	-	1	-	-
U24CY411		1.50	1.50	1.50	1	-	1.25	1	1	1	1	1	-	-
3 – HIGH, 2 – MEDIUM, 1 - LOW														

2nd Year Exit Courses Syllabi

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 IT)

(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 IT: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24IT412X	Introduction to Web Programming	2	-	2	-	4	3
2	PCC	U24IT413X	Internet of Things	2	-	2	-	4	3
3	PCC	U24IT414X	Cloud Computing	2	-	2	-	4	3
4	PCC	U24IT415X	Java Full Stack Development	2	-	2	-	4	3
5	PCC	U24IT415X	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 IT: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE412X	Programming for Web Design https://onlinecourses.swayam2.ac.in/nou24_cs12/preview	-	-	6	-	6	3
2	SEC	U24SE413X	Internet of Things using Aurdino/Raspberry Pi https://onlinecourses.swayam2.ac.in/ntr24_ed44/preview	-	-	6	-	6	3
3	SEC	U24SE414X	Cloud Computing using AWS/Google Cloud https://www.coursera.org/specializations/cloud-computing	-	-	6	-	6	3
4	SEC	U24SE415X	Full Stack using JAVA / .NET https://www.coursera.org/specializations/java-fullstack	-	-	6	-	6	3
5	SEC	U24SE416X	Any other skill based course approved by BoS Chair and Dean, AA	-	-	6	-	6	3

INTRODUCTION TO WEB PROGRAMMING

Class: B.Tech. IV–Semester (Exit)			**Branch**	:	IT
Course Code	:	**U24IT412X**	**Credits**	:	**3**
Hours/Week (L-T-P-O-E)	:	**2-0-2-0-4**	**CIE**	:	**60 %**
Total Number of Teaching Hours	:	**32 Hrs**	**ESE**	:	**40 %**

Course Learning Objectives (LOs) :

This course will develop students' knowledge in /on…

LO1 : HTML & Cascading Style Sheet

LO2 : XML technologies and JavaScript

LO3 : web based applications development using Servlets

LO4 : server-side programming using JSP and Database connectivity

THEORY COMPONENT

UNIT-I	**4 Hrs**

Introduction to HTML: HTML Basics, Elements, Attributes, Tags, Basic Tags: HTML Comments, HTML Background, Paragraph, Text Styles, Heading, Lists and Symbols; Advanced Tags: Table, Forms and its elements, frames, Images, Meta tag, Planning of webpage, Model and Structure for a website, Designing web pages, Multimedia Content

CSS: Introduction, Advantages, Adding CSS, Selectors: Grouping, Type, Universal, Descendant, Child, Class selectors, ID selectors

UNIT-II	**4 Hrs**

XML: Role of XML, Prolog, Body, Elements, Attributes, Validation, Displaying XML, Namespace, XML DTD: Introduction to DTD, Purpose of DTD, Using DTD in an XML document, Element type declaration, Attribute declaration, Attribute types, String types, Tokenized types

JavaScript: Introduction, Variables, Literals, Operators, Control Structures, Conditional Statements, Arrays, Functions, Objects

UNIT-III	**4 Hrs**

Server-side Programming using Servlets: Servlet architecture, Servlet life cycle, Generic servlet and Http servlet, Building and Installing Servlet, Passing parameters to servlets, Retrieving parameters, Problems with servlet

UNIT-IV	**4 Hrs**

Java Server Pages: How JSP works, JSP and servlet, JSP syntax, JSP components, Beans, Session tracking, Database connectivity, JDBC drivers, Loading a driver, Making a connection, Executing SQL statements using MYSQL database

LABORATORY COMPONENT

List of Experiments

1. Design a web page, which allows user to enter their biographical details
2. Create a web page containing row of images/logos and when user click on that image its enlarged view should appear in (a) same window (b) new window
3. Design a web page for student registrations (new admissions) into engineering college (use validations for checking the information entered by student)
4. Design a webpage using Cascading Style Sheet features which includes CSS Colors, CSS Backgrounds, CSS Borders
5. Design a login page and perform validations using JavaScript
6. Design a Servlet for validating log-in information entered by user in a login form and the Servlet has to report back to user regarding the status of login
7. Design a Servlet which accepts information from student, for an engineering college admission and store the information entered into the database. (Use the validations while student entering the information)
8. Design a web page to store and display the details of employee at server database using JSP
9. Design a web page to perform session tracking using JSP
10. Design a web page using JSP to access MYSQL database

Textbook(s):

1 Uttam K. Roy, *Web Technologies*, United Kingdom: Oxford University Press, 2022

Reference Book(s):

1. Kogent, *Web Technologies: HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP, ADO.NET, JDBC and XML*, New Delhi: Dreamtech Press, 2013
2. Larry Ullman, *PHP for the Web: Visual QuickStart Guide*, United Kingdom: Pearson Education, 4th edition, 2008
3. Gary Bollinger and Bharathi Natarajan, *JSP: A Beginner's Guide*", New York: McGraw-Hill Education, 2001

Web and Video link(s):

1. *https://onlinecourses.swayam2.ac.in/nou24_cs09/preview NPTEL Video Lecture on Web Technology By Dr. Ashutosh Kumar Bhatt, Professor, Uttarakhand Open University, Haldwani*
2. https://archive.nptel.ac.in/courses/106/106/106106156/ *NPTEL Video Lecture on Introduction to Modern Application Development by Prof. Madhavan Mukund, Professor, IIT Madras*

Laboratory Manual (for laboratory component):

1. *Introduction to Web Programming Laboratory Manual and Record Book,* Department of IT, KITSW

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: apply HTML tags with Cascading Style Sheet to develop static web pages
CO2: design interactive web pages using JavaScript & XML
CO3: develop web applications using Servlet technologies
CO4: develop dynamic web applications using JSP programming

(based on psychomotor skills acquired from laboratory component)

CO5: design well formatted web pages using HTML & CSS
CO6: model validating web pages using JavaScript and XML
CO7: design web based applications using servlets technology
CO8: develop web application using JSP along with database connectivity

INTERNET OF THINGS

Class: B.Tech. IV –Semester (Exit)			**Branch:** IT		
Course Code	**:**	**U24IT413X**	**Credits**	**:**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE**	**:**	**60 %**
Total Number of Teaching Hours	**:**	**32 Hrs**	**ESE**	**:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

- **LO1 :** definitions, characteristics, types, and deviations of sensors and actuators with application-specific considerations
- **LO2 :** arduino programming, including IDE setup, syntax elements, control structures, and functional modules
- **LO3 :** digital I/O control, LED interfacing, and serial communication techniques with Arduino
- **LO4 :** integration of different sensors with Arduino for environmental and positional data monitoring

THEORY COMPONENT

UNIT-I	**4 Hrs**

Sensors: Definition, Characteristics, Deviations, Types-Scalar, Multimedia, Hybrid and virtual; Considerations

Actuators: Definition, Types-Hydraulic, Pneumatic, Electric, Thermal or Magnetic, Mechanical, Soft and shape memory polymers; Characteristics

UNIT-II	**4 Hrs**

Programming with Arduino: Introduction to arduino, Features, Components, Arduino IDE, Program elements-Structure, Variables and constants, Data types, Operators, Control statements, Loops, Functions, Arrays, String objects; Time, 1/O function, Display, Random numbers

UNIT-III	**4 Hrs**

Programming with Arduino: GPIO, Controlling LEDs-Blinking led without delay, Connecting an external led, RGB LED, The 7-segment display;

Analog and Digital Communication with Arduino: Introduction-Serial communication, Parallel communication, Interfacing LCD character display

UNIT-IV	**4 Hrs**

Integration of Sensors with Arduino: Interfacing with potentiometer, Temperature sensor, Detecting motion using PIR sensor, Measuring distance using infrared and ultrasonic sensor, Object position using accelerometer and localization using Global Positioning System (GPS)

Case Study: Smart campus water management system

LABORATORY COMPONENT

List of Experiments

Experiment-1

1. Introduction of Arduino IDE
2. Program to demonstrate setup () and loop () functions
3. Program to demonstrate serial and serial.begin() statements
4. Program to demonstrate serial.print() statement

Experiment-II

5. Program to demonstrate serial.available() statement
6. Program to demonstrate serial.read() and serial.write() statements
7. Program to demonstrate serial.analogRead() function
8. Program to demonstrate user defined functions

Experiment-III

9. Program to demonstrate data types.
10. Program to demonstrate variables
11. Program to demonstrate constants

Experiment-IV

12. Program to demonstrate operators
13. Program to demonstrate if statements
14. Program to demonstrate switch case
15. Program to demonstrate loops

Experiment-V

16. Program to demonstrate arrays
17. Program to demonstrate strings
18. Program to demonstrate string object

Experiment-VI

19. Program to demonstrate time based functions
20. Program to demonstrate random numbers generation

Experiment-VII

21. Program to demonstrate digital I/O functions
22. Program to demonstrate analog I/O functions

Experiment-VIII

23. Program to demonstrate light an LED
24. Program to demonstrate the 7-segment display.

Experiment-XI

25. Program for interfacing with infrared and ultrasonic sensor
26. Program for interfacing with accelerometer

Experiment-X

27. Program for interfacing with servo motor
28. Program for interfacing with stepper motor

Text Book:

1. Sudeep Mishra, Anandarupmukherjee and Arijit Roy, *Introduction to IoT*, New Delhi: University Cambridge Press, 2021 (Chapter 4)
2. Cornel Amariei, *Arduino Development Cook Book*, Birmingham: Packt Publishing Ltd., 2015. (Chapter 2-6)

Reference Book(s):

1. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh and Mahendra Swain, *Internet of things With Raspberry Pi and Arduino*, Boca Raton: CRC Press, Taylor & Francis Group, 2020.
2. Brian Evans, Beginning Arduino Programming, New York: A press, 2011.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc25_cs44/preview *NPTEL Video Lecture on Introduction to IoT by Prof. Sudip Mishra, IITK Kharagpur.*

Laboratory Manual (for laboratory component):

1. *Internet of Things Laboratory Manual and Record Book,* Department of IT, 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: classify and compare various sensors and actuators based on type, characteristics, and real-world usage.

CO2: develop and debug Arduino-based programs using various programming constructs and interfaces.

CO3: develop digital and analog interfacing techniques using Arduino for interactive device control and data exchange.

CO4: interface and program sensors with Arduino and apply them in a real-world case study like smart water management.

(based on psychomotor skills acquired from laboratory component)

CO5: develop and test basic Arduino programs using setup(), loop(), serial communication, variables, constants, and user-defined functions.

CO6: develop control structures, data types, arrays, strings, and operators in Arduino to perform logical operations and iterative tasks.

CO7: apply Arduino built-in functions to interface with digital and analog I/O devices including LEDs, sensors, and display units.

CO8: design and build Arduino-based systems for real-time applications using motor control and sensor integration.

CLOUD COMPUTING

Class: B.Tech. IV –Semester (Exit)			**Branch :**	IT
Course Code	**:**	**U24IT414X**	**Credits :**	**3**
Hours/Week (L-T-P-O-E)	**:**	**2-0-2-0-4**	**CIE :**	**60 %**
Total Number of Teaching Hours	**:**	**32 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: basic concepts of cloud and computing environments

LO2: cloud architecture and virtualization techniques

LO3: cloud platforms and real time applications used in industry

LO4: importance of security in cloud environment

THEORY COMPONENT

UNIT-I	**4Hrs**

Introduction: Cloud computing at a glance, Historical developments, Building cloud computing environment

Principles of Parallel and Distributive Computing: Eras of computing, Parallel vs. distributive computing, Elements of parallel computing, Elements of distributive computing, Technologies for distributive computing

UNIT-II	**4 Hrs**

Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples

Cloud Computing Architecture: Introduction, Cloud reference model, Types of cloud, Economics of the cloud, Open challenges

UNIT-III	**4 Hrs**

Data Intensive Computing: What is data intensive computing? Technologies for data intensive computing.

Cloud Platform in Industry: Amazon web services, Google app engine

Cloud Applications: Scientific applications: ECG analysis in the cloud

UNIT-IV	**4 Hrs**

Cloud Security: Security the top concern for cloud users, Cloud security risks, Privacy and privacy impact assessment, Trust, Cloud data encryption, Security of database services, Operating system security, Virtual machine security, Security of virtualization

LABORATORY COMPONENT

List of Experiments

1. Install VirtualBox/VMware Workstation with different Linux or Windows OS versions on top of Windows 7 or 8

2. Install a C compiler in a virtual machine and execute simple C programs
3. Install Google App Engine (GAE) and create a "Hello World" web app using Python/Java
4. Use GAE Launcher to deploy and run web applications
5. Simulate a cloud environment using CloudSim and run a custom scheduling algorithm
6. Transfer files between virtual machines using simple file-sharing methods
7. Launch a virtual machine using Trystack (OpenStack online demo)
8. Install Hadoop single-node cluster and run a word count application
9. Simulate a multi-node Hadoop cluster and run basic tasks
10. Deploy a web application on a cloud platform like AWS/GCP

Textbook(s):

1. Rajkumar Buyya, Christian Vecchiola and Thamarai Selvi, *Mastering Cloud Computing*, New Delhi: McGraw Hill, 2013 (Chapters 1 to 4 and 8 to 11)
2. Dan C. Marnescu, *Cloud Computing Theory and Practice*, Cambridge: Elsevier, 2nd edition, 2018 (Chapter 9)

Reference Book(s):

1. Dr. Kumar Saurabh, *Cloud Computing: Architecting Next-Gen Transformations Paradigms*, New Delhi: Wiley India Private Limited, 4th edition, 2018
2. Barrie Sosinsky, *Cloud Computing Bible*, Indiana: Wiley Publications, 2011
3. Anthony T.Velte, Toby J Velte and Robert Elsenpeter, *Cloud Computing: A practical Approach*, New York: McGraw Hill, 2010

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc21_cs14/preview; *NPTEL Video Lecture on CIT-003: Cloud Computing by Prof. Soumya Kanti Ghosh, IIT Kharagpur*

Laboratory Manual (for laboratory component):

1. *Cloud ComputingLaboratory Manual and Record Book,* Department of IT, KITSW

Course Learning Outcomes (COs)

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

(based on cognitive skills acquired from theory component)

CO1: analyze various cloud models and computing environments
CO2: develop cloud applications using various virtualization techniques
CO3: apply cloud platform technologies for developing real time applications
CO4: analyze the degree of security for a given cloud application

(based on psychomotor skills acquired from laboratory component)

CO5: experiment with the virtualization by installing and configuring VirtualBox/VMware with different operating systems
CO6: develop and deploy applications using Google App Engine (GAE) and cloud platforms
CO7: simulate cloud computing environments using CloudSim and analyze scheduling algorithms
CO8: apply distributed computing frameworks like Hadoop for data processing tasks

JAVA FULL STACK DEVELOPMENT

Class: B.Tech. IV –Semester (Exit)			**Branch**	:	IT
Course Code	:	**U24IT415X**	**Credits**	:	**3**
Hours/Week (L-T-P-O-E)	:	**2-0-2-0-4**	**CIE**	:	**60 %**
Total Number of Teaching Hours	:	**32 Hrs**	**ESE**	:	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: Javascripts, AJAX & jQuery

LO2: React JS and Reactforms, Client server communication

LO3: MVC pattern and MVC Architecture using Spring, RESTful API, Spring Framework

LO4: data persistence using Spring JDBC and Agile development principles

THEORY COMPONENT

UNIT-I	**4 Hrs**

Frontend Development: Javascript basics, OOPS aspects of java script memory usage and functions in JS, AJAX for data exchange with server jQuery framework jQuery events, UI components, JSON data format

UNIT-II	**4 Hrs**

REACT JS: Introduction to react ,React router and single page applications, React forms, Flow architecture and introduction to Redux, Client-server communication

UNIT-III	**4 Hrs**

Java Web Development: Java programming basics, Model view controller (MVC) pattern, MVC architecture using spring, RESTful API using spring framework.

UNIT-IV	**4 Hrs**

Databases & Deployment: Relational schemas and normalization structured query language (SQL) Data persistence using Spring, JDBC, Agile development principles and deploying application in Cloud

LABORATORY COMPONENT

List of Experiments

1. Develop a JavaScript program to remove a character at the specified position of a given string and return the new string
2. Develop and demonstrate a HTML file that includes JavaScript script for taking full name in a text field and display first, middle, last name in 3 different labels. Middle and last name may be optional, thus message like "NA" should be displayed in corresponding labels. If the input contains 2 words, then they should be considered as first and last names
3. Design HTML form for keeping student record, apply JavaScript validation in it for restriction of mandatory fields, numeric field, email-address field, specific value in a field etc.

4. Develop program to Navigation using React Router
5. Develop Single Page Application with Dynamic Routing with parameters
6. Programs to demonstrate React Forms, Controlled components and basic Basic validation
7. Program to demonstrate Client Server Communication (Fetch API Data importing react)
8. Develop Spring Boot MVC Web App
9. Program to demonstrate REST API with Spring Boot – GET Users & REST API – POST User (Spring Boot)
10. Develop a Spring boot code to demonstrate JDBC using REST APIs

Text Book:

1. Nicholas C. Zakas, *Professional JavaScript for Web Developers*, Wiely India, 3rd edition, 2012
2. AZAT MARDA ,*Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB*, Apress, 2nd edition, 2015

Reference Book(s):

1. Kogent, *Web Technologies HTML, CSS, JavaScript, ASP.NET, Servlets, JSP, PHP,ADO.NET, JDBC and XML*, Dreamtech Press, 1st edition, 2013.
2. Uttam K. Roy, *Web Technologies*, Oxford University Press, 1st edition, 2016.

Web and Video link(s):

https://onlinecourses.swayam2.ac.in/nou24_cs12/preview;*NPTEL Video Lecture on CIT-003: Web Based Technologies and Multimedia Applications by Prof.P. V. Suresh, Indira Gandhi National Open University*

Laboratory Manual (for laboratory component):

1. *Java Full Stack Development Laboratory Manual and Record Book,* Department of IT, 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: develop java script programs using object oriented concepts
CO2: develop react ,react router concepts in the implementation of client server applications
CO3: develop applications using Spring boot and REST apis
CO4: demonstrate agile development principles in the implementation and deployment of applications

(based on psychomotor skills acquired from laboratory component)

CO5: built informative web pages, design effective layouts, and implement interactive web forms
CO6: develop programs on React forms and basic validations
CO7: develop program to demonstrate spring boot framework
CO8: develop programs using JDBC using REST APIs

Course Articulation Matrix (CAM):		U24IT415X JAVA FULL STACK DEVELOPMENT												
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	U24IT415X.1	1	2	1	1	2	-	1	1	-	-	1	1	1
CO2	U24IT415X.2	1	2	1	2	1	-	1	1	-	-	1	1	1
CO3	U24IT415X.3	1	2	1	2	1	-	1	1	-	-	1	2	2
CO4	U24IT415X.4	1	2	1	2	1	-	1	1	-	-	2	2	2
CO5	U24IT415X.5	1	1	2	1	1	-	1	1	-	-	1	1	1
CO6	U24IT415X.6	1	1	1	1	1	-	-	1	-	-	1	1	1
CO7	U24IT415X.7	1	2	2	2	1	-	-	1	1	1	1	2	2
CO8	U24IT415X.8	2	2	2	2	1	-	-	1	1	1	2	2	2
U24IT404		1.13	1.75	1.38	1.63	1.33	-	1	1	1	1	1.25	1.5	1.5
3 - HIGH, 2 - MEDIUM, 1 - LOW														