ISO 9001:2015 AICTE-CII: GOLD Category Institute NAAC-'A' Grade Institute (CGPA: 3.21) NIRF-2020 Rank Band: 201-250

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)
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B.TECH. CURRICULUM

ACADEMIC YEAR: 2024–25

DEPARTMENT OF ELECTRONICS COMMUNICATION AND INSTRUMENTATION ENGINEERING

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

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

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 506 015 TELANGANA

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DEPARTMENT OF ELECTRONICS COMMUNICATION AND INSTRUMENTATION ENGINEERING

History:

PROGRAM	DESCRIPTION	
	INTAKE	NBA ACCREDITATION
UG in B.Tech. Electronics Communication and Instrumentation Engineering	• Started with 60 seats in 2019	• Will appear in: 2024-25

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 ELECTRONICS COMMUNICATION AND INSTRUMENTATION ENGINEERING: VISION AND MISSION

VISION

To achieve excellence in Electronics Communication and Instrumentation Engineering by imparting quality education to the students with a spirit of innovation & entrepreneurship aligned with the holistic & multidisciplinary approach and produce engineering graduates to serve industry and society

MISSION

M1:	To impart the required knowledge, skills and qualities to the students and make them industry ready to serve the society
M2:	To upgrade the pedagogical skills and resources for effective teaching-learning process with the help of dedicated faculty and staff
M3:	To create ambience that drives students towards innovation, research and entrepreneurship
M4:	To inculcate professional ethics and academic integrity among the students

PROGRAM EDUCATIONAL OBJECTIVES

PEO1:	**Technical Competence:** apply the knowledge of core courses of electronics communication and instrumentation engineering for development of effective and innovative solutions to engineering problems
PEO2:	**Successful Career:** excel in profession, higher education and entrepreneurship with updated technologies in communication, signal processing, VLSI, embedded systems, and instrumentation domains
PEO3:	**Soft Skills and Life-longLearning:** exhibit professional ethics, effective communication, and teamwork in solving engineering problems by adapting contemporary research towards sustainable development of society

PEOS TO MISSION MAPPING

	M1	M2	M3	M4
PEO1	3	3	2	2
PEO2	3	2	3	2
PEO3	2	3	3	2

PEO Statements	Mission Statements	Mapping Level	Justification
PEO1	**M1**	**3**	Mapped strongly: The students will acquire required KSQs in the field of Electronics Communication and Instrumentation engineering to become industry ready
	M2	**3**	Mapped strongly : The dedicated faculty and staff apply pedagogical skills and advanced resources to enable the students to develop effective and innovative solutions to engineering problems
	M3	**2**	Mapped moderately: The innovation, incubation, research and entrepreneurship (I2RE) facilities help the students in developing effective and innovative solutions to engineering problems
	M4	**2**	Mapped moderately: The students are imparted professional ethics and academic integrity

PEO2	M1	3	Mapped strongly : The students are imparted required knowledge, skills and qualities to excel in profession, higher education and entrepreneurship
	M2	2	Mapped moderately : The dedicated faculty and staff with upgraded pedagogical skills and resources help the students to excel in profession, higher education and entrepreneurship
	M3	3	Mapped strongly : The students are driven towards innovation, research and entrepreneurship through I2RE ambience
	M4	2	Mapped moderately : The students are imparted professional ethics and academic integrity
PEO3	M1	2	Mapped moderately : The students are imparted professional ethics, effective communication, and teamwork in solving engineering problems to make them industry ready and serve the society
	M2	3	Mapped strongly : The dedicated faculty and staff with upgraded pedagogical skills and resources help the students to solve engineering problems by adapting contemporary research for sustainable development of society
	M3	3	Mapped strongly : The I2RE facilities drive the students towards sustainable development of society through contemporary research
	M4	2	Mapped moderately : The students are imparted professional ethics and academic integrity towards sustainable development of society

PROGRAM SPECIFIC OBJECTIVES

PSO1:	Apply the fundamentals of Electronics, Communication Signal processing, VLSI, Embedded Systems and Instrumentation in development of hardware and software prototypes and systems for complex engineering problems
PSO2:	Apply appropriate methodology, contemporary hardware and software tools to solve complex engineering problems related to embedded systems

PO/PSO TO PEO MAPPING

PO's		PEO1	PEO2	PEO3
PO1	Engineering Knowledge	3	3	3
PO2	Problem Analysis	3	3	3
PO3	Design/Development of solutions	3	2	3
PO4	Conduct investigations of complex problems	3	2	3
PO5	Engineering tool usage	3	2	2
PO6	The engineer and the world	2	2	3
PO7	Ethics	3	3	3
PO8	Individual and Teamwork	3	3	3
PO9	Communication	2	2	3
PO10	Project management and finance	1	2	2
PO11	Lifelong Learning	3	3	3
PSO1	Apply the fundamentals of Electronics, Communication Signal processing, VLSI, Embedded Systems and Instrumentation in development of hardware and software prototypes and systems for complex engineering problems	3	3	2
PSO2	Apply appropriate methodology, contemporary hardware and software tools to solve complex engineering problems related to embedded systems	3	3	2

DESIGN OF CURRICULUM

Salient Features

- The URR24 regulations are in line with the National Education Policy 2020 (NEP2020) and the AICTE model curriculum to provide multidisciplinary holistic education to produce well-rounded engineering graduates.
- Multiple Entry Multiple Exit (MEME) option.
- Multidisciplinary four year UG programme with award of following degrees
  - B. Tech
  - B. Tech with "Minor"
  - B. Tech "Honours"
  - B. Tech "Honours with Research"
- 170+ Credit Liberal Engineering Education.
- A strong programme core of 16 courses and 4 baskets of programme electives to ensure the breadth and depth in a chosen domain of studies. Programme 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 programme 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 Experiential Learning (EL) towards multidisciplinary holistic education and for increased employability.
- These regulations provide Competency-Focused Outcome Based Curriculum (CF-OBC) for skill development, multidisciplinary learning, wider access, inclusiveness and entrepreneurship.
- In our CF-OBC, each course has an additional component of "Contents for self-study", which is carefully designed to ensure additional hours of learners engagement. The learner thus is nurtured towards the "Self-Learning" and "lifelong learning" which are essential attributes of a 21st Century learner. The same is incorporated in the scheme of instructions in the form of (i) Outside the class work (self-study) hours, (ii) total engagement hours for every course.
- In summary, these regulations are expected to develop technical competencies through courses from programme core, programme electives, engineering science and basic science; and also develop generic competencies, soft skills, social, physical, mental and spiritual personality through carefully articulated courses from MOPEC baskets, liberal learning and humanities sequels. Thus, offer a unique "T-Shaped" liberal "Pi-Model" of Engineering Education.

The Curriculum consists of the following components of study:

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

Multidisciplinary Open Elective Courses (MOPEC)

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

Practicum

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

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

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

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

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

Program Core Courses (PCC)

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

Program Electives Courses (PEC)

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

(For example, the ECE programme shall offer verticals in "Embedded Systems & VLSI", "Signal Processing", "Communication", etc.)

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

Activity based learning (ABL) is blended with the Curriculum for ensuring holistic growth of the learner. These activity based 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 ECIE; UG Diploma in ECIE after the study of two academic years (four semesters); and B.Voc in ECIE degree after the completion of three academic years (six semesters). The successful completion of four years undergraduate programme would lead to B.Tech in ECIE 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.

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

5. 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

6. 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

7. Building Competencies through Pedagogy:

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

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

(ii) The emphasis is on critical thinking and challenge to current subject orthodoxy and develop innovative solutions. Curricular content must be presented in ways that invite questioning and not as a body of ready knowledge to be assimilated or reproduced. Faculty should be facilitators of questioning and not authorities on knowledge.

(iii) Classroom teaching should focus on the 'how' of things i.e. the application of theory and ideas. All courses including social sciences and humanities shall have design projects 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 wherever necessary.

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

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

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

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

10. CONFORMANCE TO NEP 2020

10.1 MULTIPLE EXIT OPTIONS

Sl. No.	Exit Description	ExitPoint	Degree/Certificate offered	Goal
1.	First Exit	After completion of First year.	UG Certificate in ECIE	The student should be employable as Technical Assistant (ECIE) in any industry/organization.
2.	Second Exit	After completion of Second year.	UG Diploma in ECIE	The student should be employable as Technician (ECIE) in any industry /organization.
3.	Third Exit	After completion of Third year.	B. Voc in ECIE	The student should be employable as Technical Supervisor (ECIE) in any industry/organization.
4.	Normal Exit	After completion of Fourth year.	B.Tech in ECIE	The student should be employable as an Engineer (ECIE) 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 TGCHE guidelines & through Common Entrance Examination TSEAPCET
2.	Second Entry	III-Sem of the program	The successful completion of first year with UG certificate in ECIE from our institute.
3.	Third Entry	V-Sem of the program	The successful completion of UG Diploma in ECIE from our institute.
4.	Fourth Entry	VII-Sem of the program	The successful completion of B. Voc in ECIE 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 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	22	22	24	23	23	22	21	15	172
B. Tech with Minor	22	22	24	23	23	22	21	15	172(+18)*
B. Tech with Honours	22	22	24	23	23	22	21	15	172(+18)*
B. Tech. Honours with Research	22	22	24	23	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

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

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

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

12. Distribution of Courses:

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

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	HSM01	U24MH205	English Communication and Report Writing	II	2
2.	HSM02	U24MH508	Technical English	V	1
3.	HSM03	U24MB605	Management Course Basket	VI	3
				Total:	6

(ii) Basic Science Courses (BSC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	BSC 01	U24MH101	Engineering Mathematics - I	I	3
2.	BSC 02	**U24PY102B**	Engineering Physics *(for ECIE)*	I	4
3.	BSC 03	U24MH201	Engineering Mathematics - II	II	3
4.	BSC 04	**U24CY202B**	Engineering Chemistry *(for ECIE)*	II	4
5	BSC 05	U24MH301C	Mathematical Foundations for Signal Processing	III	3
				Total:	17

(iii) Engineering Science Courses (ESC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	ESC 01	U24CI104	Programming for Problem Solving with C	I	4
2.	ESC 02	**U24EE105B**	Basic Electrical Engineering *(Common to ECE and ECI)*	I	4
3.	ESC 03	U24CI204	Data Structures through C	II	4
4.	ESC 04	U24ME207	Engineering Graphics through CAD	II	1
5.	ESC 05	U24CI305	OOP through Java	III	4
6.	ESC 06	U24CI405	Python Programming	IV	4
				Total:	21

(iv) Program Core Courses (PCC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1	PCC 01	U24CI103	Electronic Measurements and Instrumentation	I	3
2	PCC 02	U24CI203	Analog Electronics	II	3
3	PCC 03	U24CI302	Sensors and Actuators	III	4
4	PCC 04	U24CI303	Analog Integrated	III	4

			Circuits and Applications		
5	PCC 05	U24CI304	Digital Circuits and Logic Design	III	3
6	PCC 06	U24CI401	VLSI Design	IV	4
7	PCC 07	U24CI402	Digital Signal Processing	IV	4
8	PCC 08	U24CI403	Electromagnetic Theory and Wave Propagation	IV	3
9	PCC 09	U24CI404	Computer Architecture & Microprocessors	IV	3
10	PCC 10	U24CI502	Microcontrollers and Embedded Systems	V	4
11	PCC 11	U24CI503	Linear Control Systems	V	3
12	PCC 12	U24CI504	Artificial Intelligence and Machine Learning	V	4
13	PCC 13	U24CI602	Internet of Things	VI	4
14	PCC 14	U24CI603	Biomedical Instrumentation and Signal Processing	VI	3
15	PCC 15	U24CI604	Analog and Digital Communications	VI	4
16	PCC 16	U24SE607	AIML Applications Lab	VI	1
17	PCC 17	U24CI703	Industrial Automation and Control	VII	4
18	PCC 18	U24CI704	Satellite & Fiber Optic Communication	VII	3
19	PCC 19	U24CI705	Data Communication and Networking	VII	3
				Total:	64

(v) Program Elective Courses (PEC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1	PEC 01	U24EC602A	Embedded Systems with ARM Processor	VI	3
		U24EC602B	Cloud Computing		
		U24EC602C	System Verilog for Verification		
		U24EC602D	Computer Vision		
		U24EC602E	Digital Image Processing		
2	PEC 02	U24EC702A	Real Time Operating Systems	VII	3
		U24EC702B	Industrial Internet of Things		
		U24EC702C	FPGA Architectures		
		U24EC702D	Deep Learning		
		U24EC702E	Advanced Signal Processing		

3	PEC 03	U24EC802A	Embedded Linux Systems	VIII	3
		U24EC802B	Industrial Internet of Things		
		U24EC802C	Low power VLSI design		
		U24EC802D	Natural Language Processing		
		U24EC802E	Wireless and Mobile Communications		
4	PEC 04	U24EC803A	Embedded Automotive Systems	VIII	3
		U24EC803B	Cloud Computing		
		U24EC803C	Static Timing Analysis		
		U24EC803D	Reinforcement Learning		
		U24EC803E	Coding Techniques		
				Total:	12

(vi) Experiantial Learning Courses (ELC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1	ELC01	U24EL108	Practicum-1	I	1
2	ELC02	U24EL209	Practicum-2	II	1
3	ELC03	U24EL309	Practicum-3	III	1
4	ELC04	U24EL408	Practicum-4	IV	1
5	ELC05	U24CI509	Seminar	V	1
6	ELC06	U24CI608	Mini Project	VI	1
7	ELC07	U24CI706	Internship Evaluation*	VII	1
8	ELC08	U24CI707	Major Project, Phase-1 / Industrial Internship - 1	VII	4
9	ELC09	U24CI804	Major Project, Phase – 2 / Idustrial Internship - 2	VIII	6
				Total:	17

(vii) Indian Knowledge System Courses (IKSC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	IKSC	U24IK100	AICTE Mandated Student Induction Programme (Universal Human Values - I)	Student Induction Programme	0
2.	IKSC	U24IK506A	Essence of Indian Traditional Knowledge	5	2
3.	IKSC	U24IK606B	Universal Human Values-II	6	2
				Total:	4

(viii) Multidisciplinary Open Electives Courses (MOPEC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	MOPEC 01	U24OE501	MOPEC-I	V	3
2.	MOPEC 02	U24OE701	MOPEC-II	VII	3
3.	MOPEC 03	U24OE801	MOPEC-III	VIII	3
				Total:	9

(ix) Value Added Courses (VAC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	VAC 01	U24CY106	Environmental Studies	I	0
2.	VAC 02	U24VA109XXXXX	SEA – I / SAA-1	I	1
3.	VAC 03	U24VA206	Sports and Yoga	II	1
4.	VAC 04	U24VA210XXXXX	SEA-2 / SAA -2	II	1
5.	VAC 05	U24VA306	Quantitative Aptitude and Logical Reasoning	III	2
6.	VAC 06	U24VA309XXXXX	SEA-3 / SAA -3	III	1
7.	VAC 07	U24VA406B	Soft and Interpersonal Skills Lab	IV	1
8.	VAC 10	U24VA409XXXXX	SEA - 4 / SAA - 4	VI	1
				Total:	8

(x) Skill Enhancement Courses (SEC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	SEC 01	U24SE208	Programming Skill Development Lab - 1	II	1
2.	SEC 02	U24SE308	Programming Skill Development Lab - 2	III	1
3.	SEC 03	U24SE407	Programming Skill Development Lab - 3	IV	1
4.	SEC 04	U24SE507	Programming Skill Development Lab - 4	V	1
				Total:	4

(xi) Ability Enhancement Courses (AEC)

S. No.	Course Type	Course Code	Course Name	Semester	Credits
1.	AEC 01	U24AE107	IDEA Lab Makerspace	I	1
2.	AEC 02	U24AE110	Expert Talk Series-1	I	1
3.	AEC 03	U24AE211	Expert Talk Series-2	II	1
4.	AEC 04	U24AE311	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)

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

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

Activity Based Learning (ABL) @ Value Added Courses

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

Social Empowerment Activities - SEA

- These activities are designed to uplift and empower a group or community. The emphasis is on collective benefit, social change, and improving the conditions or capabilities of a community or specific group within society.
- These are categorized under four groups namely
  1. **Swacch Bharat** (Clean India)

     The aim of activities under Swachh Bharat is to promote cleanliness, hygiene, and sanitation across India.
  2. **Shikshit Bharat**(Educated India)

     The aim of activities under Shikshit Bharat is to ensure inclusive and equitable quality education for all, promoting lifelong learning opportunities.
  3. **Samruddha Bharat**(Prosperous India)

     The aim of activities under 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**	Innovation, Business Model & Entrepreneurship
		SE302	Product Development and Prototyping
		SE303	Design Thinking/ Critical Thinking & Problem Solving
		SE304	Fundraising and Proposal Writing in Entrepreneurship
		SE305	Digital Marketing & Branding
		SE306	Identify a Social Problem & Work on the Solution using AICTE-IDEA LAB
		SE307	Meet with Entrepreneurs and Understand Business Models
		SE308	Entrepreneurial Case Study Analysis
		SE310	Any other activity approved by Dean Academic Affairs
SEA Group-4: Surakshit Bharat	**NCC**	**SE401**	NCC participation/National Integrity
		SE402	Basics of fire safety/Community safety
		SE403	Disaster Management
		SE404	Environmental health & sustainability
		SE405	Road safety
		SE406	Pollution control
		SE410	Any other activity approved by Dean Academic Affairs

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

Table: SAA

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

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

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

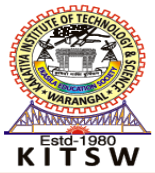
13. SUMMARY OF CURRICULUM COMPONENTS

S.NO.	CATEGORY	COURSE COMPONENT	TOTAL COURSES	TOTAL CREDITS	CURRICULUM CONTENT (%OF CREDITS)
1	HSMC	Humanity, Social Sciences and Management Courses	3	6	3.48
2	BSC	Basic Science Courses	5	17	9.88
3	ESC	Engineering Science Courses	8	29	16.86
4	PCC	Program Core Courses	16	55	31.97
5	PEC	Program Elective Courses	4	12	6.97
6	MOPEC	Multidisciplinary Open Elective Courses	3	09	5.23
7	ELC	Experiential Learning Courses	9	17	9.88
8	IKSC	Indian Knowledge System Courses	3	4	2.32
9	VAC	Value Added Courses	8	8	4.65
10	SEC	Skill Enhancement Courses	5	5	2.90
11	AEC	Ability Enhancement Courses	7	7	4.06
12	STE	Startups and Entrepreneurship Courses	1	3	1.74
		Total	**71**	**172**	**100**

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	2/8		1/3				2/1	1/1	2/2			10/22
II	2/7	2/5	1/2	1/3			1/1	2/1	1/1	1/1			11/21
III	1/3	1/4		3/11			1/1	2/3	1/1	1/1			10/24
IV		1/4		4/14			1/1	2/3	1/1	1/1			10/24
V			1/1	3/11	1/3		1/1		1/1	1/1	1/2	1/3	10/23
VI			1/3	4/12		1/3			1/1	1/1	1/2		9/22
VII				3/10	1/3	1/3			2/5				7/21
VIII					1/3	2/6			1/6				4/15
Total	**5/17**	**6/21**	**4/6**	**19/64**	**3/9**	**4/12**	**4/4**	**8/8**	**9*/17**	**7/7**	**2/4**	**1/3**	**71/172**
% Weightage of Course Category	9.88% (17/172)	12.13% (21/172)	3.46 % (6/172)	36.99 % (64/172)	5.7% (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 % (71/172)

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



KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE
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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)
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Scheme of Instructions

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

Stream – I

S. 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	U24PY102B	Engineering Physics *(for ECIE)*	2	1	2	5	10	4
3	PCC	U24CI103	Electronic Measurements and Instrumentation	2	1	-	4	7	3
4	ESC	U24CI104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105B	Basic Electrical Engineering (*Common to ECE and ECIE*)	2	1	2	5	10	4
6	VAC	U24CY106	Environmental Studies	2	-	-	3	5	-
7	AEC	U24AE107	IDEA Lab Makerspace	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109XXXXX	SEA – I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
			Total:	12	5	8	37	62	22
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

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

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

II SEMESTER

Stream-I

S. 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	U24CY202B	Engineering Chemistry *(for ECIE)*	2	1	2	5	10	4
3	PCC	U24CI203	Analog Electronics	2	1	-	4	7	3
4	ESC	U24CI204	Data Structures through C	2	1	2	5	10	4
5	HSMC	U24MH205	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA206	Sports and Yoga	-	-	2	2	4	1
7	ESC	U24ME207	Engineering Graphics through CAD*	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development (PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210X XXXX	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				10	4	10	36	60	22
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

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

Bridge Courses for exit:

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

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

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

Exit Options to Qualify for UG Certificate in ECIE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CI212X	Digital Electronics	2	-	2	-	4	3
2	PCC	U24CI213X	Operational Amplifiers and Applications	2	-	2	-	4	3
3	PCC	U24CI214X	Communication Systems	2	-	2	-	4	3
4	PCC	U24CI215X	Any other course approved by BoS Chair andDean AA	2	-	2	-	4	3

(OR)

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

Exit Options to Qualify for UG Certificate in ECIE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE212XCI	Consumer Electronics	-	-	6	-	6	3
2	SEC	U24SE213XCI	Radio Engineering	-	-	6	-	6	3
3	SEC	U24SE214XCI	Electronics Servicing and Maintenance	-	-	6	-	6	3
4	SEC	U24SE215XCI	Electronics & Hardware - Operation And Maintenance Of Respiratory Equipment STC-Operation__Maint_of_Resp_Eqpt_NSQF-3.pdf (nimilearningonline.in)	-	-	6	-	6	3
5	SEC	U24SE216XCI	Electronic Testing &AssemblyOperator ntsc_hyd_detail_24082022_electronic.pdf (nsic.co.in)	-	-	6	-	6	3
6	SEC	U24SE217XCI	Any other skill based course approved by BoS Chair and Dean AA	-	-	6	-	6	3

III SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH301C	Mathematical foundations for Signal Processing	2	1	-	6	9	3
2	PCC	U24CI302	Sensors and Actuators	2	1	2	5	10	4
3	PCC	U24CI303	Analog Integrated Circuits and Applications	2	1	2	5	10	4
4	PCC	U24CI304	Digital Circuits and Logic Design	2	1	-	4	7	3
5	ESC	U24CI305	OOP through Java	2	1	2	5	10	4
6	VAC	U24VA306A	Quantitative Aptitude and Logical Reasoning@	2		-	2	4	2
7	SEC	U24SE307	Programming Skill Development Lab – 2(DSC)	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXXXX	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
Total:				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)				-	-	-	-	-	-

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

@U24VA306 T & P Basket		
S. No.	**Course Code**	**Course Title**
1.	U24VA306A	Quantitative Aptitude and Logical Reasoning ***(for Stream I)***
2.	U24VA306B	Soft and Interpersonal Skills Lab ***(for Stream II)***

IV SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PCC	U24CI401	VLSI Design	2	1	2	5	10	4
2	PCC	U24CI402	Digital Signal Processing	2	1	2	5	10	4
3	PCC	U24CI403	Electromagnetic Theory and Wave Propagation	2	1	-	4	7	3
4	PCC	U24CI404	Computer Architecture and Microprocessors	2	1	-	4	7	3
5	ESC	U24CI405	Python Programming	2	1	2	5	10	4
6	VAC	U24VA406B	Soft and Interpersonal Skills Lab	-	-	2	2	4	1
7	SEC	U24SE407	Programming Skill Development Lab – 3 (Java)	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XXXXX	SEA - 4 / SAA - 4	-	-	-	2	2	1
10	AEC	U24AE410	Expert Talk Series-4	-	-	-	1	1	1
11	VAC*	U24CY411*	Environmental Studies*	2*	-	-	3	5	-
Total:				12	5	8	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)				-	-	-	-	-	-

For Lateral Entry Students Only

@U24VA306 T & P Basket		
S. No.	**Course Code**	**Course Title**
1.	U24VA406A	Quantitative Aptitude and Logical Reasoning *(for Stream II)*
2.	U24VA406B	Soft and Interpersonal Skills Lab *(for Stream I)*

Bridge Courses for exit:

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

OR

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

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

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

Exit Options to Qualify for UG Diploma in ECIE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CI412X	Introduction to Microcontrollers and Embedded Systems	2	-	2	-	4	3
2	PCC	U24CI413X	Fundamentals of Internet of Things	2	-	2	-	4	3
3	PCC	U24CI414X	Printed Circuit Board Design	2	-	2	-	4	3
4	PCC	U24CI415X	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 Options to Qualify for UG Diploma in ECIE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE412XCI	Data Communication and Networking	-	-	6	-	6	3
2	SEC	U24SE413XCI	Electronics Servicing and Maintenance	-	-	6	-	6	3
3	SEC	U24SE414XCI	Advanced PCB Designing ntsc_hyd_detail_24082022_electronic.pdf (nsic.co.in)	-	-	6	-	6	3
4	SEC	U24SE415XCI	Android APP Development Microsoft Word - 5. SOFWARE I 2022-23_ENG_HINDI (nsic.co.in)	-	-	6	-	6	3
5	SEC	U24SE416XCI	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

S. 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	U24CI502	Microcontrollers and Embedded Systems	2	1	2	5	10	4
3	PCC	U24CI503	Linear Control Systems	2	1	-	4	7	3
4	PCC	U24CI504	Artificial Intelligence and Machine Learning	2	1	2	5	10	4
5	STE	U24ST505X	Startups and Entrepreneurship Basket *	2	1	-	2	5	3
6	IKSC	U24IK506A	Essence of Indian Traditional Knowledge	2	-	-	2	4	2
7	SEC	U24SE507	Programming Skill Development Lab – 4(Python)	-	-	2	2	4	1
8	HSMC	U24MH508	Technical English	-	-	2	2	4	1
9	ELC	U24CI509	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

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

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

VI SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PEC	U24CI601	Program Elective –I / MOOCs-I	2	1	-	4	7	3
2	PCC	U24CI602	Internet of Things	2	1	2	4	9	4
3	PCC	U24CI603	Biomedical Instrumentation and Signal Processing	2	1	-	4	7	3
4	PCC	U24CI604	Analog and Digital Communications	2	1	2	5	10	4
5	HSMC	U24MB605X	Management Courses Basket	2	1	-	2	5	3
6	IKSC	U24IK606B	Universal Human Values-II	2	-	-	2	4	2
7	PCC	U24SE607	AIML Applications Lab	-	-	2	2	4	1
8	ELC	U24CI608	Mini Project	-	-	2	2	4	1
9	AEC	U24AE609	Expert Talk Series-6	-	-	-	1	1	1
Total:				12	5	8	25	50	22
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	5
Total credits for Honours/Minor students:				-	-	-	-	-	27
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

@ **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

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

Bridge Courses for exit:

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

OR

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

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

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

Exit Option to Qualify for B. Voc in ECIE: Any Two (02) Courses during the 2 - Months internship									
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**O**	**E**	**C**
1	**PCC**	**U24CI610X**	FPGA Architectures	**2**	**-**	**2**	**-**	**4**	**3**
2	**PCC**	**U24CI611X**	Process Control	**2**	**-**	**2**	**-**	**4**	**3**
3	**PCC**	**U24CI612X**	Optical Fiber Communication	**2**	**-**	**2**	**-**	**4**	**3**
4	**PCC**	**U24CI613X**	Any other course approved by BoS Chair and Dean AA	**2**	**-**	**2**	**-**	**4**	**3**

(OR)

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

Exit Option to Qualify for B. Voc in ECIE: Any Two (02) Skill based Courses -:									
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**O**	**E**	**C**
1	**SEC**	**U24SE610XCI**	**Advanced Mobile Communication**	**-**	**-**	**6**	**-**	**6**	**3**
2	**SEC**	**U24SE611XCI**	**Cyber Security** Microsoft Word - 5. SOFWARE I 2022-23_ENG_HINDI (nsic.co.in)	**-**	**-**	**6**	**-**	**6**	**3**
3	**SEC**	**U24SE612XCI**	PLC PROGRAMMER ntsc_hyd_hindi_24082022_electrical.pdf (nsic.co.in)	**-**	**-**	**6**	**-**	**6**	**3**
4	**SEC**	**U24SE613XCI**	Any other skill based course approved by BoS Chair and Dean AA	**-**	**-**	**6**	**-**	**6**	**3**

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

VII SEMESTER

S. 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	U24CI702	Program Elective - II/ MOOCs-II	2	1	-	4	7	3
3	PCC	U24CI703	Industrial Automation and Control	2	1	2	4	9	4
4	PCC	U24CI704	Satellite and Fiber Optic Communication	2	1	-	4	7	3
5	PCC	U24CI705	Data Communication and Networking	2	1	-	4	7	3
6	ELC	U24CI706	Internship Evaluation*	-	-	2	-	2	1
7	ELC	U24CI707	Major Project, Phase-1 / Industrial Internship - 1	-	-	8	6	12	4
Total:				10	5	12	25	52	21
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	24

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

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

B. Tech Honours with Research

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

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

VIII SEMESTER

S. 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	U24CI802	Program Elective - III / MOOCs-IV	2	1	-	4	7	3
3	PEC	U24CI803	Program Elective - IV / MOOCs-V	2	1	-	4	7	3
4	ELC	U24CI804	Major Project, Phase – 2 / Industrial Internship - 2	-	-	12	4	16	6
Total:				6	3	12	15	36	15
Additional Learning@:Maximum credits allowed for Honours/Minor				-	-	-	-	-	4
Total credits for Honours/Minor students:				-	-	-	-	-	19

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

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

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

SUMMARY

SEMESTER	I	II	III	IV	V	VI	VII	VIII	TOTAL
CREDITS	22	22	24	23	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 MOPEC courses:

U	2	4	O	E	X	0	1	C	E	A
URR24 Curriculum			MOPEC Elective		Semester in which MOPEC opted (5/7/8)	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) ECIE: CI-MOPEC BASKET

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

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

(V) CSE: CS-MOPEC BASKET

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

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

(VI) IT ENGINEERING: IT-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01ITA	Computer Networks
2	U24OEX01ITB	Ethical hacking
3	U24OEX01ITC	Programming with C++
4	U24OEX01ITD	Web Design Technologies
5	U24OEX01ITE	Software Project Management
6	U24OEX01ITF	Java Full stack development
7	U24OEX01ITG	DevOps
8	U24OEX01ITH	NET Programming
9	U24OEX01ITI	Software Testing and Quality Assurance
10	U24OEX01CSZ	Any other course approved by BoS Chair and Dean AA

(VII) ELECTRICAL ENGINEERING: EE-MOPEC BASKET

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

V/VII/VIII SEMESTER		
1	U24OEX01EEA	Linear Control Systems
2	U24OEX01EEB	Introduction to Electric Vehicles
3	U24OEX01EEC	Renewable Energy Systems
4	U24OEX01EED	Smart Electric Grid
5	U24OEX01EEE	Generation & 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	Anthropology
2	U24OEX01ARB	Ancient India
3	U24OEX01ARC	Constitution of INDIA
4	U24OEX01ARD	Medieval India
5	U24OEX01ARE	Geography
6	U24OEX01ARF	Modern India
7	U24OEX01ARG	Indian Polity
8	U24OEX01ARH	Indian Economy
9	U24OEX01ARZ	Any other course approved by BoS Chair and Dean AA

* Through MOOCS only

(XIX) LAW*: LW-MOPEC BASKET

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

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

(XX) I²RE : IE-MOPEC BASKET

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

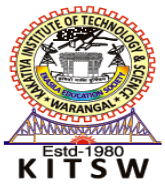
V/VII/VIII SEMESTER		
1	U24OEX01IEA	Understanding Incubation & Entrepreneurship
2	U24OEX01IEB	Innovation, Business Models & Entrepreneurship
3	U24OEX01IEC	Innovation & Startup Policy
4	U24OEX01IED	Entrepreneurship & IP Strategies
5	U24OEX01IEE	Digital Marketing Strategies
6	U24OEX01IEF	Leadership, Innovation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

Department of Electronics Communication and Instrumentation Engineering

PROGRAM ELECTIVE COURSES (PEC)

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

VERTICAL/ PE	PE1	PE2	PE3	PE4
VERTICAL 1: Embedded Systems	U24CI601A: Embedded Systems with ARM Processor	U24CI702A: Real Time Operating Systems	U24CI802A: Embedded Linux Systems	U24CI803A: Embedded Automotive Systems
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 2: Internet of Things	U24CI601B: Cloud Computing	U24CI702B: Web Technologies	U24CI802B: Industrial Internet of Things	U24CI803B: Privacy and Security in IoT
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 3: VLSI	U24CI601C: System Verilog for Verification	U24CI702C: FPGA Architectures	U24CI802C: Low power VLSI design	U24CI803C: Static Timing Analysis
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 4: AI and ML	U24CI601D: Computer Vision	U24CI702D: Deep Learning	U24CI802D: Natural Language Processing	U24CI803D: Reinforcement Learning
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			
VERTICAL 5: Communication and Signal Processing	U24CI601E: Digital Image Processing	U24CI702E: Advanced Signal Processing	U24CI802E: Wireless and Mobile Communications	U24CI803E: Coding Techniques
	(OR)			
	Equivalent MOOC approved by BoS Chair and Dean AA			



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)
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Semester -I Syllabi

I SEMESTER

Stream – I

S. 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	U24PY102B	Engineering Physics *(for ECIE)*	2	1	2	5	10	4
3	PCC	U24CI103	Electronic Measurements and Instrumentation	2	1	-	4	7	3
4	ESC	U24CI104	Programming for Problem Solving with C	2	1	2	5	10	4
5	ESC	U24EE105B	Basic Electrical Engineering (*Common to ECE and ECIE*)	2	1	2	5	10	4
6	VAC	U24CY106	Environmental Studies	2	-	-	3	5	-
7	AEC	U24AE107	IDEA Lab Makerspace	-	-	2	2	4	1
8	ELC	U24EL108	Practicum-1	-	-	-	4	4	1
9	VAC	U24VA109	SEA – I / SAA-1	-	-	-	2	2	1
10	AEC	U24AE110	Expert Talk Series-1	-	-	-	1	1	1
			Total:	**12**	**5**	**8**	**37**	**62**	**22**
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean, AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				**-**	**-**	**-**	**-**	**-**	**-**

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 $Q(X) = X^m V(X)$ *[(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*, Khanna Publishers, Delhi, 44th edition, 2017

Reference Book(s):

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

Web and Video link(s):

1. https://youtu.be/4EYko9rdF7g?si=WUu12 *NPTEL Video Lecture on Infinite series by Prof. S.K.Ray, Professor of Mathematics, IITK Kanpur.*
2. https://youtu.be/0apMXhWG_W8?si=M-abw2Gq3buX5HLM *NPTEL Video Lecture on Fundamental mean value theorems by Prof. 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	1
CO2	**U24MH101.2**	2	2	1	1	-	-	-	1	1	-	1	1	1
CO3	**U24MH101.3**	2	2	1	1	-	-	-	1	1	-	1	1	1
CO4	**U24MH101.4**	2	2	1	1	-	-	-	1	1	-	1	1	1
U24MH101		**2**	**2**	**1**	**1**	**-**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

ENGINEERING PHYSICS (*for ECIE)*			
Class: B.Tech. I- Semester		**Branch:** ECIE	
Course Code:	**U24PY102B**	**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: lasers, fiber optics and their applications in various emerging fields
LO2: electricity, magnetism and dielectric & magnetic materials
LO3: semiconductor physics and semiconductor diodes
LO4: rectifiers, filters 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**

Electricity and Magnetism: Basic laws of electricity and magnetism, Electric displacement, Maxwell's equations

Dielectric and Magnetic materials: Dielectrics, Dielectric constant, Dielectric polarization, Types of polarization, Dielectric breakdown; Magnetic materials- Permeability, Magnetization, Susceptibility, Origin of magnetism, Bohr magneton, Ferro, Antiferro and ferri magnetic materials, Hysteresis, Soft and hard magnetic materials and applications

Self Learning Topics (SLTs): *polarization (Text3: topic 5.3), properties of dielectric (Text3: topic 5.6), eddy currents(Text3: topic 6.5).*

UNIT-III	**9 Hrs**

Semiconductor Physics: Classification of solids based on energy band theory- Conductors, Semiconductors and Insulators, Intrinsic semiconductors- Carrier generation and recombination, Intrinsic conductivity; Extrinsic semiconductors- p-type and n-type (qualitative), Extrinsic conductivity, Variation of Fermi energy level with temperature and impurity concentration, Drift and diffusion currents; Hall effect (qualitative)

Semiconductor Diodes: Formation of a PN junction, Forward and reverse bias, PN junction diode, Diode current equation, V-I characteristics, Zener diode, Zener diode as voltage regulator, Light emitting diode (LED) and applications, Photodiode and applications

Self Learning Topics (SLTs): *drift and diffusion current (Text2: topic 4.9), diode current equation (Text2: topic 4.15), Solved problems (Text2: Prob 4.17 to 4.21)*

UNIT-IV	9 Hrs

Rectifiers: Types of rectifiers- Half-wave rectifier, Full-wave rectifier, Ripple factor, Filters- L, C, LC(L-section) and CLC (π - section)

Bipolar Junction Transistors (BJTs): Transistor structure, Representation of NPN and PNP transistors, Transistor operation, Transistor configurations - Common base(CB), Common emitter(CE) and Common collector(CC); α, β, γ parameters and their relations
Phototransistor: Operation and applications

Self Learning Topics (SLTs): *Solved problems (Text2: Prob18.1 to 18.3), transistor as amplifier (Text2: topics 6.7), Solved problems (Text2: Prob 6.1 to 6.5)*

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. Numerical aperture and acceptance angle of an optical fiber
5. Determination of dielectric constant of materials using parallel plate capacitor
6. Magnetic hysteresis- B-H curve tracing using CRO
7. Study of V-I characteristics of PN junction diode
8. Study of V-I characteristics of LED
9. Study of characteristics of half-wave and full-wave rectifier
10. Study of common emitter characteristics of NPN transistor
11. Study of energy band gap of a semiconductor material
12. Determination of Hall coefficient, carrier density of given semiconducting material using Hall effect setup

Textbook(s):

1. M. Avadhanulu and Kshirsagar, TVS Arun Murthy, A Text Book of Engineering Physics, S. Chand & Company Ltd, 11th edition, 2018
2. S Salivahanan, N Suresh Kumar, Electronic devices and circuits, Mc Graw Hill, 3rd edition, 2017
3. K.B.Raina, S.K.Bhattacharya, T. Joneja, Electrical Engineering Materials and Electronic Components, S.K.Kataria & Sons Publisher, 2005

Reference Book(s):

1. Bhattacharya and Bhaskaran, *Engineering Physics*, Oxford University Press, 1st edition, 2013
2. V. Rajendran, *EngineeringPhysics*, Mc Graw Hill, 2013
3. R.K. Gaur and S.L.Gupta, *Engineering Physics*, Dhanpath Rai and Sons publications, 2013
4. David Halliday, Robert Resnick & S Krane, *Physics Volume I&II*, Wiley India Limited, 5th edition, 2014

Web and Video link(s):

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

4. https://onlinecourses.nptel.ac.in/noc24_ee143/preview, *NPTEL video lecture on Semiconductor Devices and Circuits by Prof. Sanjiv Sambandan, IISc Bangalore*

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: determine static electric field and magnetic field using Maxwell's equations; determine the properties of dielectric and magnetic materials

CO3: analyze V-I characteristics of semiconductor diodes

CO4: calculate ripple factor & efficiency of diode rectifier circuits and analyze transistor input /output characteristics

(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: determine 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):		**U24PY102B ENGINEERING PHYSICS**											
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	**U24PY102B.1**	2	1	1	-	-	1	1	1	1	-	1	1	1
CO2	**U24PY102B.2**	2	1	-	-	-	1	1	1	1	-	1	1	1
CO3	**U24PY102B.3**	2	1	-	-	-	1	1	1	1	-	1	1	1
CO4	**U24PY102B.4**	2	1	-	-	-	1	1	1	1	1	1	1	1
CO5	**U24PY102B.5**	2	1	1	-	1	1	1	1	2	-	1	1	1
CO6	**U24PY102B.6**	2	1	-	-	1	1	1	1	2	-	1	1	1
CO7	**U24PY102B.7**	2	1	-	-	1	1	1	1	2	-	1	1	1
CO8	**U24PY102B.8**	2	1	-	1	1	1	1	1	2	1	1	1	1
U24PY102B		**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1.5**	**1**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Class: B.Tech. I -Semester		**Branch:** ECIE	
Course Code: U24CI103	**U24CI103**	**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: measurement system, electromechanical instruments and their applications
LO2: electronic instruments, DC & AC bridge circuits and their applications
LO3: working principle of resistive, inductive transducers and their applications
LO4: sensing principle of capacitive, piezoelectric & thermoelectric transducers and their applications

UNIT-I	**9 Hrs**

Measurement System: Introduction, Significance, Standards of measurement, Generalized block diagram, Examples, Static characteristics, Dynamic response, Types of errors

Electromechanical Instruments (*Principle of operation*): PMMC mechanism, DC ammeter, Multi range ammeter, DC voltmeter, Multi range voltmeter, Ohmmeter, Rectifier type Instrument

Self Learning Topics (SLTs): *Standards of Measurement (Text1:topic 1.3), Problems on Errors (Text1:topic 1.12)*

UNIT-II	**9 Hrs**

Electronic Instruments (*Block diagram approach*): Introduction and advantages, Digital multimeter (DMM) - Resolution & accuracy of 3½ & 4½ DMM; Q-meter principle, Oscilloscopes – Working principle of cathode ray tube (CRT), Cathode ray oscilloscope (CRO), Deflection sensitivity, Digital storage oscilloscope (DSO), CRO measurements

DC & AC Bridges: Wheatstone bridge, Maxwell bridge, Schering bridge, Wien's bridge, Applications of bridges

Self Learning Topics (SLTs): *Dual trace oscilloscope (Text1:topic 2.5.13), Kelvin bridge (Text1:topic 2.6.4)*

UNIT-III	**9 Hrs**

Sensors and Transducers (*Principle of operation*): Introduction, Classification, ideal requirements

Resistance transducers: Potentiometer, Strain gauge (SG) - gauge factor, classification, full bridge SG configuration, Applications of SG (force, torque), Rosette, RTD, Thermistor

Inductive transducers: Electromagnetic type, Variable reluctance type, LVDT, Applications of LVDT (displacement, pressure)

Self Learning Topics (SLTs): *Electro dynamic type transducer (Text1:topic 7.7.1.2), Electromagnetic frequency domain transducer (Text1:topic 7.21.2)*

UNIT-IV	**9 Hrs**

Capacitive transducers: Variable gap, Variable area & variable dielectric type, Differential type capacitive transducer, Applications of capacitive transducers (sound, level)

Piezoelectric transducers: Piezoelectric phenomenon, Piezoelectric materials, Sensitivity constants, Modes of operation (LE, TE & VE), Bimorphs, Applications of piezoelectric transducers (stress, acceleration)

Thermoelectric transducers: Thermoelectric effects, Thermocouple materials and types,

Thermoelectric laws, Thermopile

Self Learning Topics (SLTs): *Thermocouple cold junction compensation circuit (Text1:topic 12.2.5.4, example 12.3), Optical pyrometers (Text1: topics 12.2.7)*

Course Learning Outcomes (COs):

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

CO1: develop measurement system based on application requirements and utilize electromechanical instruments for current, voltage & resistance measurement

CO2: measure amplitude, frequency, phase & quality factor using electronic instruments

CO3: classify transducers and select appropriate resistive & inductive transducers to measure physical parameters

CO4: recommend suitable transducer to measure sound, level, stress, acceleration & temperature

Textbook(s):

1. R.K. Rajput, *Electronic Measurements and Instrumentation,* S. Chand & Co., New Delhi 3rd edition, 2020

Reference Book(s):

1. Helfrick. A.D and Cooper W.D., *Modern Electronic Instrumentation and Measurement Techniques*, Pearson India Education, New Delhi, 2nd edition, 2016
2. B. C. Nakra and K. K. Chaudhry, *Instrumentation Measurement and Analysis,* Tata Mc Graw-Hill Education pvt. Ltd., New Delhi, 4th edition, 2016
3. A.K. Sawhney, *A course in Electrical and Electronics Measurements and Instrumentation*, Dhanpatrai & Co., New Delhi, 2020
4. P. Pruthviraj, B. Bhudaditya, S. Das and K. Chiranjib, *Electrical and Electronic Measurement and Instrumentation*, McGraw-Hill Education, New Delhi, 2nd edition, 2013

Web and Video link(s):

1. https://archive.nptel.ac.in/courses/108/105/108105153/; *NPTEL Video Lecture on Electrical Measurements and Electronic instruments, by Prof. Avishekh Chatarjee, Professor of Electrical Engineering, IITK Kharagpur.*
2. https://archive.nptel.ac.in/courses/108/108/108108147/; *NPTEL Video Lecture on Sensors and Actuators by Assistant professor, Department of Electronic Systems Engineering, IISC Bangalore.*

Course Articulation Matrix (CAM):		**U24CI103 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION**											
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24CI103.1**	2	1	-	-	-	-	1	1	1	1	1	2	-
CO2	**U24CI103.2**	2	1	-	-	-	-	1	1	1	1	1	2	-
CO3	**U24CI103.3**	2	1	1	1	1	1	1	1	1	1	1	2	2
CO4	**U24CI103.4**	2	1	1	1	1	1	1	1	1	1	1	2	2
U24CI103		**2**	**1**	**1**	**1**	1	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PROGRAMMING FOR PROBLEM SOLVING WITH C

Class: B.Tech. I -Semester		**Branch:** Common to all branches	
Course Code:	**U24CI104**	**Credits:**	**4**
Hours/Week (L-T-P-O-E):	**2-1-2-5-10**	**CIE:**	**60%**
Total Number of Teaching Hours:	**60 Hrs**	**ESE:**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

LO2: control structures and array operations

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

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

THEORY COMPONENT

UNIT-I	**9 Hrs**

Introduction to Programming: Art of programming through algorithms and flowcharts

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

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

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

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

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

UNIT-II	**9 Hrs**

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

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

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

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

UNIT-III	**9 Hrs**

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

Modular Programming with User Defined Functions: Need for user-defined functions, Elements of user-defined functions, Definition of functions, Return values and their types,

Function calls, Function declaration, Category of functions, Recursion, The scope, visibility and lifetime of variables (storage classes)

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

UNIT-IV	**9 Hrs**

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

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

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

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

LABORATORY COMPONENT

List of Experiments

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

Textbook(s):

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

Reference Book(s):

1. Paul Deitel, Harvey Deitel, *C How to Program: With Case Studies Introducing Applications Programming and Systems Programming*, Pearson Education Limited, 9th edition, 2022
2. Brian W. Kernighan and Dennis Ritchie, *The C Programming Language*, Pearson Education India, 2nd edition, 2015
3. Reema Thareja, *Programming in C,* Oxford University Press, 3rd edition, 2023

4. Yashavant Kanetkar, *Let Us C,* BPB Publications, 19th edition, 2022
5. A.K.Sharma, *Computer Fundamentals and Programming in C,* Universities Press, 2nd edition, 2018

Web and Video link(s):

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

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

CO1: enumerate programming development steps, design an algorithm and draw a 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, & storage classes.

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

Course Articulation Matrix (CAM):		**U24CI104: 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	**U24CI104.1**	2	1	1	1	-	-	1	-	1	-	2	1	2
CO2	**U24CI104.2**	2	2	2	1	-	-	1	-	1	-	2	2	2
CO3	**U24CI104.3**	2	2	3	1	-	-	1	-	1	-	2	2	2
CO4	**U24CI104.4**	2	2	3	2	-	-	1	-	1	-	2	2	2
CO5	**U24CI104.5**	1	1	1	1	1	-	1	1	1	-	2	1	2
CO6	**U24CI104.6**	1	2	2	2	1	-	1	1	1	-	2	2	2
CO7	**U24CI104.7**	1	2	3	2	1	-	1	1	1	-	2	2	2
CO8	**U24CI104.8**	1	2	3	2	1	-	1	1	1	-	2	2	2
U24CI104		**1.5**	**1.75**	**2.25**	**1.5**	**1**	**-**	**1**	**1**	**1**	**-**	**2**	**1.75**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

BASIC ELECTRICAL ENGINEERING

(Common to ECE & ECIE)

Class: B.Tech. I -Semester		**Branch:** Common to ECE & ECIE	
Course Code:	**U24EE105B**	**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 circuits, 3-Ø AC circuits, and series resonance
LO4: construction, principles, and applications of DC & AC machines, concepts of earthing, fuses, and MCB

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 & Reciprocity theorem. (T and π networks only).

***Self-Learning Topics (SLTs):** Condition for maximum power transfer (Text1: Topics3.9), Solved problems (Text1: Prob 3.15, 3.18, 3.23 & 3.25), Practice problems (Text1: Chap-3,Prob 9,10,13 & 14).*

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, Parallel RL, RC & RLC circuits, Concept of reactance, Impedance, Susceptance, Admittance, Complex power, Real power, Reactive power and Power factor & Series Resonance.

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 Earthing (Qualitative treatment):

Electrical Machines: Construction, Principle of operation, Characteristics & applications of 1- Ø transformer, 1- Ø induction motor, DC motor, Stepper motor and BLDC motor.

Electrical earthing, Fuses: Basic concepts of electric shock, Earthing, Fuses, Miniature Circuit Breaker (MCB)

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. Uma Rao, *Basic Electrical Engineering* , Pearson Education, edition,2011

Reference Book(s):

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

Web and Video link(s):

https://nptel.ac.in/courses/108/105/108105112//; *NPTEL Video Lecture on 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 the 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, power in 1- Ø & 3- Ø AC circuits and bandwidth & quality factor of series resonant circuit

CO4: select a suitable electrical machine for a given application and analyze the essential roles of electrical earthing, fuses, and MCBs in electrical systems

(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 using load test and verify Kirchhoff's laws using PSPICE

Course Articulation Matrix (CAM):		**U24EE105B : 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	**U24EE105B.1**	2	1	-	-	-	-	1	1	1	1	**1**	2	1
CO2	**U24EE105B.2**	2	2	-	-	-	-	1	1	1	1	**1**	2	1
CO3	**U24EE105B.3**	3	3	1	1	1	1	1	1	1	1	**1**	2	1
CO4	**U24EE105B.4**	3	3	1	1	1	1	1	1	1	1	**1**	2	1
CO5	**U24EE105B.5**	2	1	-	-	-	-	1	1	1	1	**1**	2	1
CO6	**U24EE105B.6**	2	2	-	-	-	-	1	1	1	1	**1**	2	1
CO7	**U24EE105B.7**	3	3	1	1	1	1	1	1	1	1	**1**	2	1
CO8	**U24EE105B.8**	3	3	1	1	1	1	1	1	1	1	**1**	2	1
U24EE105B		**2.5**	**2.25**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

ENVIRONMENTAL STUDIES

Class: B.Tech. I Semester		**Branch:** Common to CE, EEE, ECIE, ECE & CSE	
Course Code:	**U24CY106**	**Credits:**	**0**
Hours/Week (L-T-P-O-E):	**2-0-0-3-5**	**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: 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

Textbook(s):

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

Reference Book(s):

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

Course Articulation Matrix (CAM):		**U24CY106 ENVIRONMENTAL STUDIES**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24CY106.1**	2	1	2	1	-	2	1	1	1	-	-	1	1
CO2	**U24CY106.2**	-	-	2	-	-	1	1	1	1	1	-	1	1
CO3	**U24CY106.3**	1	2	1	-	-	1	1	1	1	1	1	1	1
CO4	**U24CY106.4**	-	-	1	-	-	1	1	1	1	-	1	1	1
U24CY106		**1.5**	**1.5**	**1.5**	**1**	**-**	**1.25**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

IDEA Lab Makerspace

Class: B.Tech. I Semester		**Branch:** Common to all branches	
Course Code:	**U24AE107**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-2-2-4**	**CIE :**	**60 %**
Total Number of Lab Hours:	**24 Hrs**	**ESE :**	**40 %**

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):		**U24AE107 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	**U24AE107.1**	2	2	1	1	2	1	1	2	2	-	1	1	1
CO2	**U24AE107.1**	2	2	1	1	2	1	1	2	2	-	1	1	1
CO3	**U24AE107.1**	2	2	1	1	2	1	1	2	2	-	1	1	1
CO4	**U24AE107.1**	2	2	1	1	2	1	1	2	2	-	1	1	1
U24AE107		**2**	**2**	**1**	**1**	**2**	**1**	**1**	**2**	**2**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PRACTICUM-1

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

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

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

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

(iii). Allotment of Practicum topics for students:

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

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

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

(Signature of class teacher)

****

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

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

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

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

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

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

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

Video pitch	20 marks
Total	100 marks

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

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

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

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

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

(d) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

Course Articulation Matrix (CAM):		**U24EL108 PRACTICUM-1**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**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**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

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

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

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

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

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

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

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

Monitoring SEA/SAA:

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

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

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

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

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

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

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

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

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

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

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

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

vi. Other skills important for fieldwork practice include the ability to act in a

crisis, to plan, set priorities, mobilize resources, and implement the plan effectively. These skills used in an integrated manner help students solve their problems and to develop one's own leadership style based on the need and culture of the place.

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

Eminent personalities/ Achievers / Renowned personalities:

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

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

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

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

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

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

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

- During feedback, the central focus is on the elaboration of the students'

experience during fieldwork. Therefore, the student should create an end product, such as a demonstration/presentation and report in which they demonstrate a link between their experiences during fieldwork and the underlying theoretical concepts and ideas.

(e) **Demonstration/Presentation and Report**: Student after presentation/ demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit and submit a report, in the prescribed format, to the faculty counsellor for award of grade.

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

i. ***Faculty counsellor approval***: In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

ii. ***Identification of goals and preparation of action plan:*** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity, every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.

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

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

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

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

The CIE for SEA/SAA is as follows:

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

Note:

(a) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

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

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

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

Text / Reference book(s):

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

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

Course Code: **U24VAXYY(SE/SA)ZZZ**

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

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

EXPERT TALK SERIES-1

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in / on…

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(o) Salient features of ETS are hereunder:

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

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

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

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

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

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

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

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

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

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

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

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

ii. Supplementary Exam:

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

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

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

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

Course Learning Outcomes (COs):

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

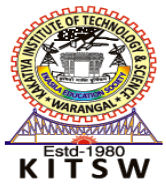
CO1: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

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

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

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

Course Articulation Matrix (CAM):		**U24AE110 EXPERT TALK SERIES-1**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**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**
3 – HIGH, 2 – MEDIUM, 1 - LOW														



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)
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Semester -II Syllabi

II SEMESTER

Stream-I

S. 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	U24CY202B	Engineering Chemistry *(for ECIE)*	2	1	2	5	10	4
3	PCC	U24CI203	Analog Electronics	2	1	-	4	7	3
4	ESC	U24CI204	Data Structures through C	2	1	2	5	10	4
5	HSMC	U24MH205	English Communication and Report Writing	2	-	-	3	5	2
6	VAC	U24VA206	Sports and Yoga	-	-	2	2	4	1
7	ESC	U24ME207	Engineering Graphics through CAD	-	-	2	2	4	1
8	SEC	U24SE208	Programming Skill Development (PSD) Lab - 1	-	-	2	2	4	1
9	ELC	U24EL209	Practicum-2	-	-	-	4	4	1
10	VAC	U24VA210	SEA-2 / SAA -2	-	-	-	2	2	1
11	AEC	U24AE211	Expert Talk Series-2	-	-	-	1	1	1
Total:				**10**	**4**	**10**	**36**	**60**	**22**
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

Exit Options to Qualify for UG Certificate in ECIE: Any Two (02) Courses during the 2 - Months internship									
S. No.	**Category**	**Course Code**	**Course Title**	**L**	**T**	**P**	**O**	**E**	**C**
1	**PCC**	**U24CI212X**	Digital Electronics	**2**	**-**	**2**	**-**	**4**	**3**
2	**PCC**	**U24CI213X**	Operational Amplifiers and Applications	**2**	**-**	**2**	**-**	**4**	**3**
3	**PCC**	**U24CI214X**	Communincation Systems	**2**	**-**	**2**	**-**	**4**	**3**
4	**PCC**	**U24CI215X**	Any other course approved by BoS Chair andDean AA	**2**	**-**	**2**	**-**	**4**	**3**

MATRIX THEORY AND VECTOR CALCULUS

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

UNIT-I	**9 Hrs**

Matrices:

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

Self-Learning Topics (SLTs): *Review of Matrices [Text 1: topics 2.1,2.2,2.3,2.4,2.5]*
PAQ –Normal form [Text 1, topic 2.7(7), Solved problems: 2.26, Practice problems: exercise 2.4 (9,10)]
Additional problems on System of homogeneous and non-homogeneous equations [Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14)]
Additional problems on Eigen values and Eigen vectors [Text 2: topic 8.1, Solved problems: 8.1(1,2), Practice problems: exercise 8.1(4,6)]
Nature of Quadratic form [Text 1: topic 2.18, Solved problems: 2.52, Practice problems: exercise 2.10 (13,14))

UNIT-II	**9 Hrs**

Multiple Integrals and Beta, Gamma functions:

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

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

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

UNIT-III	9 Hrs

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

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

UNIT-IV	9 Hrs

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

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

Course Learning Outcomes (COs):
After completion of this course, the students should be able to…
CO1: analyze eigen value problems using matrix theory
CO2: apply basic concepts of multiple integrals in evaluating physical quantities of real-life engineering problems
CO3: apply differential operators on vector and scalar point functions
CO4: solve line, surface, volume integrals and correlate these with applications of Green, Stoke and Gauss divergence theorems

Textbook(s):
1. Grewal, B.S., *Higher Engineering Mathematics*, Khanna Publishers, Delhi, 44th edition, 2017 (Chapters 2,7,8)
2. Kreyszig E, *Advanced Engineering Mathematics*, Inc, U.K, John Wiely & Sons, 10th edition, 2020 (Chapter 8(8.2))

Reference Book(s):
1. Spiegel M, *Vector Analysis* -Schaum's Series, McGraw Hill, 2nd edition, 2017
2. S.S. Sastry, *Engineering Mathematics, Vol.II,* Prentice Hall of India, 3rd edition, 2014

3. Gilbert Strang, *Introduction to Linear Algebra*, Wellesley-Cambridge Press, 5th edition
Web and Video link(s): 1. https://youtu.be/L4crGhtEX14?si=hyjAPgDheJOhXtYZ : *NPTEL Video Lecture on Matrix Analysis with Applications/Dr.S.K.Gupta and Dr.Sanjeev Kumar/IIT Roorkee* 2. https://youtu.be/ksS_yOK1vtk?si=CNNA58OIuszubPiX : *NPTEL Video Lecture on Integral and Vector Calculus./Prof.Hari Shankar Mahato / IIT Kharagpur*

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

ENGINEERING CHEMISTRY

(for ECIE)

Class: B.Tech. II -Semester		**Branch:** ECIE	
Course Code:	**U24CY202B**	**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, corrosion and preventive methods
LO3: UV, Visible, IR spectroscopy and flame photometry
LO4: mass spectroscopy and chromatography

THEORY COMPONENT

UNIT-I	**9 Hrs**

Electrochemical Energy Systems: Specific conductance, Equivalent conductance, Effect of dilution; Conductometric titrations-Acid base titrations-Strong acid Vs strong base, Weak acid Vs strong base, Strong acid Vs weak base and Weak acid Vs weak base; Electrode potential, pH meter, Principle of pH measurements, Electrodes, pH meters, Nernst equation; Potentiometric titrations-Acid base titrations; Biosensors
Batteries: Primary and secondary batteries-Lead acid battery and Li ion battery
Fuel cells: Hydrogen-oxygen fuel cell

Self Learning Topics (SLTs): *Types of conductors (Text1: chapter 5 topic 1), Ohms law (Text1: chapter 5 topic 5)*

UNIT-II	**9 Hrs**

Water Technology and Corrosion: Hardness of water, Estimation of hardness of water by complexometry, Alkalinity, Determination of alkalinity, Numerical problems, Determination of fluoride by spectrophotometry, Ion-exchange method, Reverse osmosis, Electro dialysis; Quality parameters of potable water (BIS and WHO)

Corrosion: Dry corrosion, Wet corrosion, Pilling-Bedworth rule, Effect of purity, Relative areas of anodic and cathodic parts, Nature of surface film, Humidity, pH and temperature on corrosion; Cathodic protection-Impressed current cathodic protection, Sacrificial anodic protection; Electroplating

Self Learning Topics (SLTs): H*ard water and soft water, Units of hardness (Text1: chapter 1 topic 5), Introduction to Corrosion (Text1; chapter 7 topic 1), Galvanic series (Text1: chapter 7 topic 12)*

UNIT-III	**9 Hrs**

UV-Visible Spectroscopy: Lambert-Beer's law, Instrumentation, Formation of absorption bands, Theory of electronic spectroscopy, Fluorescence, Phosphorescence; Applications of UV-Visible spectroscopy
IR-Spectroscopy: Principle, Theory of molecular vibrations, Selection rules, Spectral features of some classes of compounds, Important features of IR spectroscopy and applications
Flame photometry: Principle of flame photometry, Instrumentation, Applications
Self Learning Topics (SLTs): *Electromagnetic spectrum (Text1; hapter 35 topic 1), Atomic*

emission spectroscopy (Text1; chapter 35 topic 26), Atomic absorption spectroscopy (Text1; chapter 35 topic 28)

UNIT-IV	**9 Hrs**

Mass Spectroscopy: Basic principle, Instrumentation, Determination of molecular formulae, Important features of mass spectroscopy, Mass analyzers

Chromatography: Chromatography, Basic definitions, Gas chromatography, Basic parts of a gas chromatography, Methods of measurement of peak areas

Liquid Chromatography: Liquid chromatographs, Types of liquid chromatography, column, Thin layer chromatography

Self Learning Topics (SLTs): *Types of spectra* ***(****Text1: chapter 35 topic 3), introduction to chromatography* ***(****Text1: chapter 33 topic 1)*

LABORATORY COMPONENT

List of Experiments

1. Estimation of hydroxide ion [OH^-] 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)

Textbook(s):

1. Jain and Jain, *Engineering Chemistry*, Dhanpat Rai Publishing Company, 17th edition, 2019

Reference Book(S):

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

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

1. *Engineering Chemistry laboratory manual 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: determine the constituent elements of a sample using UV Visible and IR spectroscopy
CO4: apply techniques of mass spectroscopy and chromatography for analysis of samples
(based on psychomotor skills acquired from laboratory component)
CO5: estimate hydroxide ion and alkalinity of water sample
CO6: determine total hardness and oxygen dissolved in water
CO7: determine molarities of acids and bases
CO8: prepare nano materials and polymers

Course Articulation Matrix (CAM):		**U24CY202B ENGINEERING CHEMISTRY (*for ECIE*)**												
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	**U24CY202B.1**	2	-	-	-	1	1	1	-	1	-	1	1	1
CO2	**U24CY202B.2**	2	-	-	-	1	1	1	-	1	-	1	1	1
CO3	**U24CY202B.3**	2	2	2	2	1	1	1	1	-	-	-	1	1
CO4	**U24CY202B.4**	2	2	2	1	1	1	1	1	-	-	-	1	1
CO5	**U24CY202B.5**	2	1	-	-	-	1	1	-	1	-	1	1	1
CO6	**U24CY202B.6**	2	1	-	-	2	1	1	-	1	-	1	1	1
CO7	**U24CY202B.7**	2	1	-	-	-	1	1	-	1	-	1	1	1
CO8	**U24CY202B.8**	2	1	-	-	-	1	1	-	1	-	1	1	1
U24CY202B		**2.00**	**1.33**	**2.00**	**1.50**	**1.20**	**1.00**	**1.00**	**1.00**	**1.00**	**-**	**1.00**	**-**	**1.00**

ANALOG ELECTRONICS

Class: B.Tech. II -Semester	**Branch:** Common to ECI and EEE		
Course Code:	**U24CI203**	**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: small signal low frequency analysis of transistor amplifier circuits
LO2: frequency response of RC-coupled amplifier and JFET & MOSFET characteristics
LO3: negative feedback amplifier circuits
LO4: oscillator circuits and large signal amplifiers

UNIT-I	**9 Hrs**

Bipolar Junction Transistor (BJT) Biasing: Bias stability - Need for biasing , Operating point, Thermal runaway; Stability factor (S), Methods of BJT biasing - Fixed bias, Collector to base bias, Self bias

Small Signal Low Frequency Transistor Amplifier Circuits: BJT small signal low frequency h-parameter model, Analysis of transistor amplifier circuits using h-parameters, Analysis of single stage CE transistor amplifier circuits, Hybrid- Л(pi) Common emitter transistor model

Self Learning Topics (SLTs): E*mitter feedback bias (Text1: topics6.12.2), Simplified CE and CC h-parameter model (Ref1: topics 12.4 , 12.5), Solved problems (Text1: Examples 6.30, 6.37,6.41), Solved problems (Text1:Examples 9.3, Prob 9.4)*

UNIT-II	**9 Hrs**

Multistage Amplifiers : Different coupling schemes used in cascading of amplifiers, Choice of transistor configurations in cascading, Effect of cascading on gain and bandwidth, Frequency response of RC coupled amplifier, Emitter follower, Darlington connection

Junction Field Effect Transistor (JFET) : Construction and operation, Characteristic parameters of JFETs, Drain & transfer characteristics, FET as a switch, Analysis of single stage FET amplifier, Metal Oxide Semiconductor Field Effect Transistor(MOSFET) – structure and operation of Enhancement MOSFET and Depletion MOSFET

Self Learning ***Topics (SLTs):*** *General analysis of cascade amplifier(Text1:topics10.3) ,cascode amplifier (Text1: topics 10.3,10.9), solved problem(Text1:Example10.1)*

UNIT-III	**9 Hrs**

Feedback Amplifiers: Basic concept of feedback, Negative feedback amplifiers - Characteristics, Effect of negative feedback, Topologies; Analysis of voltage series, Voltage shunt, Current series and Current shunt feedback amplifiers

Self Learning Topics (SLTs): *effect of feedback on input and output impedances (Text1:topics14.6.14.7), Solved problems (Text1: Prob 14.7, Prob 14.10,14.13)*

UNIT-IV	**9 Hrs**

Oscillators: Conditions for oscillations (Barkhausen criterion), RC and LC oscillators, Crystal Oscillator

Large Signal Amplifiers: Classification based on biasing, Series fed and transformer coupled Class A amplifier, Class B power amplifier, Push-pull and complementary symmetry Class B amplifiers, Cross over distortion, Class-AB power amplifier

Self Learning Topics (SLTs): *classification of oscillators (Text1:topics 15.2),Second and higher order harmonic distortion(Text1: topics 12.4,12.5), Thermal stability and heat sinks (Text1: topics 12.9)*

Course Learning Outcomes (COs):

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

CO1: design biasing circuits for BJT amplifier and apply h-parameters to determine the gain & impedance of BJT amplifiers

CO2: analyze the frequency response of RC coupled amplifier and volt-ampere characteristics of JFET &MOSFET

CO3: determine the gain and impedance of the feedback amplifier by identifying its topology

CO4: estimate the frequency of oscillations of given oscillator and efficiency of a large signal amplifier

Textbook(s):

1. S. Salivahana and N.Suresh Kumar, *Electronic Devices and Circuits*, McGraw Hill Education , New Delhi, 3rd edition, 2015

Reference Book(s):

1. Jacob Millman and C.C.Halkias, *Integrated Electronics*, Tata McGraw-Hill, New Delhi, 2nd edition, 1991
2. Robert L.Boylestad, Louis Nashelsky, *Electronic Devices and Circuit Theory*, Pearson education, New Delhi, 10th edition, 2013
3. Donald A Neamen, *Electronic Circuits Analysis and Design*, Tata McGraw-Hill, New Delhi, 3rd edition, 2009

Web and Video link(s):

1. https://www.youtube.com/watch?v=PSdHf6yozyc; *NPTEL Video Lecture on Transistor Biasing by Prof. T.S.Natarajan, Department of physics, IIT Madras*
2. https://www.youtube.com/watch?v=BSR26SU3R2U; *NPTEL Video Lecture on RC coupled amplifiers – frequency response by Prof. D.C. Dube, Department of Physics, IIT Delhi*
3. https://www.youtube.com/watch?v=xHNDrbB-iWY; *NPTEL Video Lecture on positive feedback and oscillations by Dr.Chitralekha Mahanta, Department of Electronics and Communication Engineering ,IIT Guwahati*
4. https://www.youtube.com/watch?v=4m49vM0Ryt8; *NPTEL Video Lecture on Field Effect Transistors Prof. T.S.Natarajan, Department of physics, IIT Madras*

Course Articulation Matrix (CAM):		**U24CI203 ANALOG ELECTRONICS**												
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	**U24CI203.1**	2	2	-	-	-	-	1	1	1	1	1	2	2
CO2	**U24CI203.2**	2	2	-	-	-	-	1	1	1	1	1	2	2
CO3	**U24CI203.3**	2	2	-	-	-	-	1	1	1	1	1	2	2
CO4	**U24CI203.4**	2	2	-	-	-	-	1	1	1	1	1	2	2
U24CI203		**2**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**1**	**1**	**1**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

DATA STRUCTURES THROUGH C

Class: B.Tech. II –Semester		**Branch:** Common to all branches	
Course Code:	**U24CI204**	**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. Debasis Samanta, *Classic Data Structures*, Prentice Hall India, 2nd edition, 2009

Reference Book(s):

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

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs):

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

(based on cognitive skills acquired from theory component)

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

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

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

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

(based on psychomotor skills acquired from laboratory component)

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

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

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

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

Course Articulation Matrix (CAM):		**U24CI204 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	**U24CI204.1**	2	2	2	1	-	-	1	-	1	-	1	2	1
CO2	**U24CI204.2**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO3	**U24CI204.3**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO4	**U24CI204.4**	2	2	2	2	-	-	1	-	1	-	2	2	2
CO5	**U24CI204.5**	2	2	2	1	-	-	1	1	1	-	1	2	1
CO6	**U24CI204.6**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO7	**U24CI204.7**	2	2	2	2	-	-	1	1	1	-	2	2	2
CO8	**U24CI204.8**	2	2	2	2	-	-	1	1	1	-	2	2	2
U24CI204		**2**	**2**	**2**	**1.75**	**-**	**-**	**1**	**1**	**1**	**-**	**1.75**	**2**	**1.75**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

ENGLISH COMMUNICATION AND REPORT WRITING

Class: B.Tech. II –Semester		**Branch:** Common to all branches	
Course Code:	**U24MH205**	**Credits:**	**2**
Hours/Week (L-T-P-O-E):	**2-0-0-3-5**	**CIE:**	**60 %**
Total Number of Teaching Hours:	**24 Hrs**	**ESE:**	**40 %**

Course Learning Objectives (LOs):

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: abridging varieties of lengthy texts and maintaining emotional balance.

UNIT-I	**6 Hrs**

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-(Text 2,Unit-II), English Vocabulary (Text 2,Unit-I, Unit-II, Unit-III)

Verb Forms (Reference book 1,Topic :31), Tenses (Reference book 1,Topics: 16,17,18,19)

Reported Speech (Reference book 2, Exercises for Practice, Topics : 161-167)

UNIT-II	**6 Hrs**

GRAMMAR

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

VOCABULARY

- Synonyms-Antonyms-Single Word Substitutes-Popular Abbreviations

READING STRATEGY

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

LIFE SKILLS: Determination

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

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

UNIT-III	**6 Hrs**

GRAMMAR

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

VOCABULARY

- Phrasal Verbs-Technical Words-Latin Words

READING STRATEGY

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

WRITING PRACTICES

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

LIFE SKILLS: Positive Attitude

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

Self Learning Topics (SLTs):

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

UNIT-IV	**6 Hrs**

GRAMMAR

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

VOCABULARY

- Appropriate Use of Words in Communication-Commonly Confused Words

ACTIVE READING and NOTE-MAKING

- Note-Making-Definition-Purpose-Effectiveness

WRITING PRACTICES

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

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

Self-Learning Topics (SLTs):

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

Course Learning Outcomes (COs):

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

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

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

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

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

Textbook(s):

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

Reference Book(s):

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

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc20_ hs56/preview Technical English for Engineers by Aisha Icbal, IIT Madars
2. https://onlinecourses.swayam2.ac.in/cec21_lg13/preview

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

Course Articulation Matrix (CAM):		**U24MH105/205: ENGLISH COMMUNICATION &REPORT WRITING**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO 1**	**PSO 2**
CO1	**U24MH105.1**	-	-	-	-	-	1	-	2	2	2	2	1	1
CO2	**U24MH105.2**	-	-	-	-	-	1	-	2	2	2	2	1	1
CO3	**U24MH105.3**	-	-	-	-	-	1	-	2	2	2	2	1	1
CO4	**U24MH105.4**	-	-	-	-	-	1	-	2	2	2	2	1	1
U24MH105/205		**-**	**-**	**-**	**-**	**-**	**1**		**2**	**2**	**2**	**2**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

SPORTS and YOGA

Class: B.Tech. II-Semester		**Branch: Common to all branches**	
Course Code:	**U24VA206**	**Credits:**	**0**
Hours/Week(L-T-P-O-E):	**0-0-2-2-4**	**CIE:**	**60 %**
Total Number of Teaching Hours:	**24Hrs**	**ESE:**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: yoga and Benefits

LO2: various Sports &Games

LO3: sportsman spirit

LO4: all round development

Sports and Games

List of Sports and Games

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

Textbook(s):

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

ReferenceBook(s):

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

Web and Video link(s):

Badminton game Video Link:

https://www.youtube.com/watch?v=HucIqi8Lw3E&t=22s

Basketball game Video Link:

https://www.youtube.com/watch?v=-tkE2lJoR58

Chess Video Link:

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

Carrom game Video Link:

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

Football game Video Link:

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

Table Tennis game Video Link:

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

Volleyball game Video Link:

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

Cricket game Video Link:

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

Handball game Video Link:

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

Kabaddi game Video Link:

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

Kho-Kho game Video Link:

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

Yoga Aasanas Video Link :

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

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

Course Learning Outcomes (COs):

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

CO1: demonstrate physical fitness by performing yoga aasanas

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

CO3: demonstrate sportsman spirit and ethics

CO4: demonstrate physical, psychological, social and emotional balance

Course Articulation Matrix (CAM):		**U24VA206 Sports and Yoga for Common to all branches**												
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PSO1**	**PSO 2**
CO1	**U24VA206.1**	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	**U24VA206.2**	-	-	-	-	-	-	-	1	-	-	-	-	-
CO3	**U24VA206.3**	-	-	-	-	-	-	2	-	-	-	-	-	-
CO4	**U24VA206.4**	-	-	-	-	-	-	-	-	1	-	1	-	-
U24VA206		**-**	**-**	**-**	**-**	**-**	**-**	**2**	**1**	**1**	**-**	**1**	**-**	**-**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

ENGINEERING GRAPHICS THROUGH CAD

Class: B. Tech. II –Semester		**Branch:** Common to all (except CE & ME)	
Course Code:	**U24ME207**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-2-2-4**	**CIE :**	**60 %**
Total Number of Teaching Hours:	**24 Hrs**	**ESE :**	**40 %**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

LABORATORY COMPONENT

List of Experiments

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

Textbook(s):

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

Reference Book(s):

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

Web and Video link(s):

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

Laboratory Manual (for laboratory component):

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

Course Learning Outcomes (COs)

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

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

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

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

PRACTICUM-2

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

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

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

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

(iii). Allotment of Practicum topics for students:

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

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

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

(Signature of class teacher)

****

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

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

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

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

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

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

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

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

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

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

(j) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.

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

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

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

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

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

Class: B.Tech. II -Semesters	**Branch:** Common to all branches		
Course Code:	**U24VA210**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-0-2-2**	**CIE:**	**100%**
Total Number of Teaching Hours:	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

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

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

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

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

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

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

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

Monitoring SEA/SAA:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Eminent personalities/ Achievers / Renowned personalities:

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

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

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

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

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

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

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

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

(e) **Demonstration / Presentation and Report**: Student after presentation/demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit

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

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

vi. ***Faculty counsellor approval***: In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

vii. ***Identification of goals and preparation of action plan:*** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity, every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.

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

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

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

(g) ***Assessment & Evaluation:*** There shall be *only Continuous Internal Evaluation (CIE) for SEA/SAA.* The SEA/SAA activities shall be evaluated at the end of the semester through respective evaluation processes, which shall include field work, presentation/ demonstration, submission of reports on the gathered data/information/ surveys, the details of which have been shown in below table. The department level SEA/SAA coordinator shall collect marks from the nodal centres and faculty counsellors, consolidate them, and submit the final grades to the examination branch, within one week of the last day of instruction. Evaluation of SEA/SAA activities shall be

completed as and when students are ready, but not later than week (N+1).

The CIE for SEA/SAA is as follows:

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

Note:

(a) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation oral presentation to qualify for course evaluation. In case of presentation, student should prepare PPT with informative slides including the geo tagged photos of his/her field trips/interactions as per the schedule notified by the nodal centre. In case of demonstration, student must take timeslot from the nodal centre and demonstrate the skills learnt/improved during the allotted timeslot.

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

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

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

Text / Reference book(s):

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

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

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

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

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

EXPERT TALK SERIES - 2

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

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

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

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

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

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

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

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

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

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

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

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

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

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

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

(h) Our competency-focussed curriculum URR24 is designed to contribute greatly to the

nurturing and development of each of these facets among students through ETS courses

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

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

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

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

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

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

(o) Salient features of ETS are hereunder:

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

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

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

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

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

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

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

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

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

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

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

(p) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

iii. Supplementary Exam:

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

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

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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)
website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in ✆ : +91 9392055211, +91 7382564888

I Year Exit Courses Syllabi

DIGITAL ELECTRONICS

Class: B.Tech. II –Semester (Exit)		**Branch:** ECIE	
Course Code:	**U24CI212X**	**Credits:**	**3**
Hours/Week (L-T-P-O-E):	**2-0-2-0-4**	**CIE :**	**60%**
Total Number of Teaching Hours:	**16Hrs**	**ESE :**	**40%**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: switching algebra and minimization techniques of switching functions
LO2: combinational circuits and their applications
LO3: flip flops and their use in the design of sequential circuits
LO4: logic circuits using PLDs

THEORY COMPONENT

UNIT-I	**4Hrs**

Number Systems and Codes: Number systems- representation, Binary arithmetic, Binary codes **Boolean Algebra and Minimization**: Postulates and theorems; Logic gates – Symbols and truth tables, Realization of switching functions - AOI, NAND-NAND and NOR-NOR realizations; 3 and 4 variable Karnaugh map minimization

UNIT-II	**4Hrs**

Combinational circuits: Design of combinational circuits using logic gates – Half adder, Full adder, Half subtractor, Full subtractor, Multiplexers, Demultiplexers, Decoders, Encoders

UNIT-III	**4Hrs**

Sequential circuits: Flip flops- SR, JK, D and T; Truth tables, Excitation tables, Race around condition, Master slave flip flop, Counters – Ripple counters, Synchronous counters; Ring and Johnson counters

UNIT-IV	**4Hrs**

Programmable logic devices (PLDS): Introduction to PLDs, read only memories (ROMs), programmable logic array devices (PLAs), Programmable array logic devices (PALs), Implementation of Boolean functions on PLDs

LABORATORY COMPONENT

List of Experiments

1. Implementation of Boolean functions using logic gates
2. Functional verification of decoder/de-multiplexer and realization of Boolean function
3. Implementation and functional verification of 4-2 Priority Encoder
4. Implementation of Half and Full Adders using logic gates
5. Realization Implementation of 4x1 multiplexer using logic gates
6. Design and functional verification of 4-bit Binary to Gray code converter
7. Design and functional verification of BCD to Excess-3 code converter
8. Functional verification of RS, JK, T and D flip-flops
9. Design and functional verification of 4-bit Shift Register
10. Functional verification of Ring and Johnson Counters

Textbook(s):

1. M. Morris Mano, *Digital Design,* PHI, 3rd edition, New Delhi , 2003

Reference Book(S):

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

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc21_ee10/preview; *NPTEL Video Lecture on Digital Electronic Circuits by Prof. GouthamSaha, Professor of E&ECE, IIT Kharagpur.*

Laboratory Manual (for laboratory component):

1. *Digital Electronics Laboratory Manual and Record Book,* Department of ECIE, 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 minimization techniques to obtain minimal SOP/POS forms of switching functions
CO2: design combinational circuits such as adders, subtractors, decoders, multiplexers, demultiplexers
CO3: design sequential circuits using flip flops
CO4: design logic circuits using PLDs

(based on psychomotor skills acquired from laboratory component)

CO5: develop logic circuits to implement Boolean functions and test the functionality
CO6: design and test the functionality of combinational circuits
CO7: design and test the functionality of asynchronous sequential circuits
CO8: design and test the functionality of synchronous sequential circuits

Course Articulation Matrix (CAM):		**U24CI212X DIGITAL ELECTRONICS**												
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	**U24CI212X.1**	2	2	-	1	1	-	-	-	-	-	1	1	1
CO2	**U24CI212X.2**	2	2	2	1	1	-	-	-	-	-	1	1	1
CO3	**U24CI212X.3**	2	2	2	1	1	-	-	-	-	-	1	1	1
CO4	**U24CI212X.4**	2	2	2	1	1	-	-	-	-	-	1	1	1
CO5	**U24CI212X.5**	2	2	2	1	2	1	1	2	1	2	1	1	1
CO6	**U24CI212X.6**	2	2	2	1	2	1	-	2	1	2	1	1	1
CO7	**U24CI212X.7**	2	2	2	1	2	1	-	2	1	2	1	1	1
CO8	**U24CI212X.8**	2	2	2	1	2	1	1	2	1	2	1	1	1
U24CI212X		**2**	**2**	**1. 75**	**1**	**1.5**	**1**	**1**	**2**	**1**	**2**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

OPERATIONAL AMPLIFIERS AND APPLICATIONS

Class: B.Tech. II –Semester(Exit)		**Branch:** ECIE	
Course Code:	**U24CI213X**	**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: building blocks and characteristics of Op-Amp
LO2: linear applications of Op-Amp
LO3: non-linear applications of Op-Amp
LO4: designing of active filters using Op-Amp

THEORY COMPONENT

UNIT-I — **4 Hrs**

Integrated circuits (ICs): Introduction, Classification of ICs
Operational Amplifier (Op-Amp): Building blocks of Op-Amp, Analysis of basic inverting & non-inverting amplifier configurations
DC & AC Characteristics of Op-Amp: DC Characteristics: Input offset voltage, Input bias current; Input offset current, Total output offset voltage, Thermal drift, Supply voltage rejection ratio (SVRR), Common mode rejection ratio (CMRR); AC Characteristics: Open loop and closed loop frequency response, Stability of Op-Amp, Slew rate, Ideal and practical characteristics of Op-Amp IC μA 741

UNIT-II — **4 Hrs**

Linear Applications of Op-Amp: Summing and difference amplifiers, Integrator, Differentiator, Voltage to Current converter, Current to Voltage converter, Instrumentation amplifier, Sample and hold circuit

UNIT-III — **4 Hrs**

Non-linear Applications Op-Amp: Precision rectifiers–half and full wave rectifiers, Log amplifier
Comparators and Waveform Generators: Op-Amp comparator, Regenerative comparator (Schmitt Trigger), and Wien's bridge oscillator

UNIT-IV — **4 Hrs**

Active filters: Introduction, Ideal and realistic frequency responses of various filters, Analysis and design of first order filters: Low pass, High pass, Band pass and Band stop, IGMF general configuration

LABORATORY COMPONENT

List of Experiments

1. Measurement of static and dynamic parameters of Op-Amp IC 741
2. Design and testing of Adder and Subtractor circuits using IC 741
3. Design and testing of differentiator using Op-Amp IC 741
4. Design and testing of integrator using Op-Amp IC 741
5. Design and testing of Instrumentation amplifier using Op-Amp IC 741
6. Design and testing of Precision rectifier using Op-Amp IC 741
7. Design and testing of log amplifier using Op-Amp IC 741
8. Design of a Wien's bridge oscillator for specified frequency using Op-Amp IC 741
9. Design and testing of first order active low pass filter using Op-Amp IC 741
10. Design and testing of first order active high pass filter using Op-Amp IC 741

Textbook(s):

1. D. Roy Choudhury and Shail B Jain, *Linear Integrated Circuits*, New Age International, New Delhi, 4th edition, 2010

Reference Book(s):

1. Ramakant Gayakwad, *Op-Amps and Linear Integrated Circuits*, Pearson Education, New Delhi, 4th edition, 2015
2. George B. Clayton, *Linear Integrated Circuits and Applications*, The Macmillan Press Ltd., London, 1975
3. Rodert F. Coughlin and Frederick F. Driscoll, *Operational Amplifiers and Linear Integrated Circuits*, Pearson Education, New Delhi, 6th edition, 2000
4. S. Salivahanan and V S Kanchana Bhaaskaran, *Linear Integrated Circuits*, McGraw Hill Education (India) Pvt. Ltd., Chennai, 3rd edition, 2019

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc23_ee65/preview; *NPTEL Video Lecture on Op-amp practical application: Design, Simulation and Implementation by Prof. Hardik J Pandya, Department of Electronic Systems Engineering, IISc Bangalore.*

Laboratory Manual (for laboratory component):

1. *Linear and Digital Integrated Circuits Laboratory Manual*, Department of ECIE, 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 characteristics of Op-Amp IC741 using fundamental concepts
CO2: design Op-Amp based linear circuits for the given specifications
CO3: design Op-Amp based non-linear circuits for the given specifications
CO4: design Op-Amp based active filters for the given specifications

(based on psychomotor skills acquired from laboratory component)

CO5: measure the static and dynamic parameters of Op-Amp IC741
CO6: design Op-Amp based circuits for linear application adder, subtractor, differentiator, and integrator
CO7: design Op-Amp based circuits for non-linear application precision rectifiers, log amplifier, and oscillators
CO8: design and test the performance of IC 741 based active filters

Course Articulation Matrix (CAM):		**U24CI213X OPERATIONAL AMPLIFIERS AND APPLICATIONS**												
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	**U24CI213X.1**	2	2	-	-	-	-	1	1	1	-	1	1	1
CO2	**U24CI213X.2**	2	2	-	-	-	-	1	1	1	-	1	1	1
CO3	**U24CI213X.3**	2	2	-	-	-	-	1	1	1	-	1	1	1
CO4	**U24CI213X.4**	2	2	-	1	1	1	1	1	1	-	1	1	1
CO5	**U24CI213X.5**	2	2	1	-	-	-	1	1	2	1	1	2	2
CO6	**U24CI213X.6**	2	2	1	1	1	1	1	1	2	1	1	2	2
CO7	**U24CI213X.7**	2	2	1	1	1	1	1	1	2	1	1	2	2
CO8	**U24CI213X.8**	2	2	1	1	1	1	1	1	2	1	1	2	2
U24CI213X		**2**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1.5**	**1**	**1**	**1.5**	**1.5**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

COMMUNICATION SYSTEMS

Class: B.Tech. II –Semester(Exit)		**Branch:** ECIE	
Course Code:	**U24CI214X**	**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: classification of signals and Fourier Series
LO2: Fourier Transform and Amplitude modulation techniques
LO3: generation of frequency and pulse modulated signals
LO4: types of digital modulation schemes

THEORY COMPONENT

UNIT-I	**4 Hrs**

Signals and systems: Overview of electronic communication systems, classification of signals, unit impulse, step, ramp and exponential signals, signal operations, convolution and correlation, Fourier series expansion, Fourier series properties, Sampling theorem, Response of a linear system in time domain

UNIT-II	**4 Hrs**

Fourier Transform: Fourier transform, Fourier transform of standard signals, Fourier transform properties, System response in frequency domain

Amplitude Modulation Systems (Qualitative): Need for frequency translation, Double side band- Supressed carrier (DSB-SC) modulation, Amplitude modulation (AM)- Double side band- with Carrier (DSB-C), Single side band modulation (SSB)

UNIT-III	**4 Hrs**

Angle Modulation (Qualitative): Types of angle modulation (Frequency modulation and Phase modulation), Modulation index, Comparison of AM, FM and PM

Pulse Modulation (Qualitative): Analog and digital signals, analog and digital communication techniques, Block diagram of digital communication system, Pulse modulation techniques - PAM, PWM and PPM waveforms, Generation and demodulation of PAM, PWM and PPM, Comparison of pulse modulation techniques, Generation and demodulation of PCM signal, Delta modulation

UNIT-IV	**4 Hrs**

Digital Modulation (Qualitative): Need for digital modulation, Bit rate and baud rate, Types of digital modulation techniques- ASK, FSK and PSK, Comparison of ASK, FSK and PSK, Applications of different digital modulation techniques

LABORATORY COMPONENT

List of Experiments

1. Generation of AM Signal, find the modulation index and percentage of modulation with different modulation signals
2. Generation of DSB-SC Signal, find the modulation index and percentage of modulation with different modulation signals
3. Determination of modulation index and frequency deviation of FM signal
4. Generation and demodulation of Analog pulse modulation signals

4.1.1 Pulse amplitude modulation
4.1.2 Pulse width modulation
4.1.3 Pulse position modulation

5. Interpretation of modulated and demodulated waveforms of a PCM system for different sampling frequencies
6. Delta modulation & demodulation
   6.1 Adaptive delta modulation and demodulation
   6.2 Sigma delta modulation and demodulation
7. Digital modulation techniques
   7.1 Amplitude shift keying
   7.2 Phase shift keying
   7.3 Frequency shift keying
8. Generate - Unit step, Ramp, Impulse, Exponential and sinusoidal signals using MATLAB
9. Perform scaling, shifting and delay operations on signals using MATLAB
10. Perform the correlation and convolution of two sequences using MATLAB
11. MATLAB implementation of Amplitude modulation
12. MATLAB implementation of Frequency modulation

Textbook(s):

1. Herbart Taub, Donald L Schilling, *Principles of Communication Systems*, 3rd edition, Tata McGraw-Hill, New Delhi, 2007

Reference Book(S):

1. R. P. Singh and S. D. Sapre, *Communication Systems (Analog and Digital),* 2nd edition, McGraw-Hill, New Delhi, 2008
2. Simon Haykin and Michael Moher, *Introduction to Analog and Digital Communications*, 2nd edition, John Wiley & Sons, USA, 2007
3. B.P. Lathi, Zhi Ding, *Modern digital and analog communication systems,* 5th edition, Oxford University Press, USA, 2019
4. K. Sam Shanmugam, *Digital and Analog Communication Systems*, John Wiley & Sons, New Delhi, 2008

Web and Video link(s):

NPTEL :: Electrical Engineering - NOC:Principles of Communication Systems - I; *NPTEL Video Lectures on principles of communication systems-1 by* Prof. Aditya K. Jagannatham, IIT Kanpur.

Laboratory Manual (for laboratory component):

2. *Communication Systems Laboratory Manual and Record Book,* Department of ECIE, 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 basic operations on signals and estimate the response of a system
CO2: analyze different amplitude modulation techniques
CO3: distinguish different pulse modulation schemes
CO4: compare different digital modulation techniques

(based on psychomotor skills acquired from laboratory component)

CO5 : determine the modulation index and percentage modulation of an AM carrier
CO6 : determine the modulation index and measure the frequency deviation of an FM signal
CO7 : develop MATLAB code to generate AM & FM modulated signals
CO8 : measure amplitude, frequency and phase in different shift keying techniques

Course Articulation Matrix (CAM):		U24CI214X COMMUNICATION 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	U24CI214X.1	1	1	1	-	1	-	1	-	1	-	1	1	1
CO2	U24CI214X.2	1	1	1	-	1	-	1	-	1	-	1	1	1
CO3	U24CI214X.3	1	1	1	-	1	-	1	-	1	-	1	1	1
CO4	U24CI214X.4	1	1	1	-	1	-	1	-	1	-	1	1	1
CO5	U24CI214X.5	1	1	1	-	2	-	1	2	1	-	1	1	1
CO6	U24CI214X.6	1	1	1	-	2	-	1	2	1	-	1	1	1
CO7	U24CI214X.7	1	1	1	-	2	-	1	2	1	-	1	1	1
CO8	U24CI214X.8	1	1	1	-	2	-	1	2	1	-	1	1	1
U24CI214X		**1**	**1**	**1**	**0**	**1.5**	-	**1**	**1**	**1**	**0**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

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కాకతీయ సాంకేతిక విజ్ఞాన శాస్త్ర విద్యాలయం, వరంగల్ - ౫౦౬ ౦౧౫ తెలంగాణ, భారతదేశము
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website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in ✆ : +91 9392055211, +91 7382564888

Semester - III Syllabi

III SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	BSC	U24MH301C	Mathematical foundations for Signal Processing	2	1	-	6	9	3
2	PCC	U24CI302	Sensors and Actuators	2	1	2	5	10	4
3	PCC	U24CI303	Analog Integrated Circuits and Applications	2	1	2	5	10	4
4	PCC	U24CI304	Digital Circuits and Logic Design	2	1	-	4	7	3
5	ESC	U24CI305	OOP through Java	2	1	2	5	10	4
6	VAC	U24VA306A	Quantitative Aptitude and Logical Reasoning@	2		-	2	4	2
7	SEC	U24SE307	Programming Skill Development Lab – 2(DSC)	-	-	2	2	4	1
8	ELC	U24EL308	Practicum-3	-	-	-	4	4	1
9	VAC	U24VA309XXXX	SEA-3 / SAA -3	-	-	-	2	2	1
10	AEC	U24AE310	Expert Talk Series-3	-	-	-	1	1	1
			Total:	12	5	8	36	61	24
Summer/ Inter-sem Bridge Courses (Approved by BoS and Dean,AA): 1 week to 10 days: 1 credit to each Bridge course under additional learning (will be printed on grade sheet)				-	-	-	-	-	-

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

@U24VA306 T & P Basket		
S. No.	**Course Code**	**Course Title**
1.	U24VA306A	Quantitative Aptitude and Logical Reasoning *(for Stream I)*
2.	U24VA306B	Soft and Interpersonal Skills *(for Stream II)*

MATHEMATICAL FOUNDATIONS FOR SIGNAL PROCESSING

Class: B.Tech. III -Semester		**Branch:** ECIE	
Course Code:	**U24MH301C**	**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:continuous-time (CT) and discrete-Time (DT) signals & systems and convolution

LO2: Fourier series representation of periodic signals

LO3: continuous-time Fourier transforms and analysis of LTI systems

LO4: Laplace transform, inverse and circuit analysis

UNIT-I	**9 Hrs**

Signals and Systems: Continuous-time (CT),sampling theorem(statement only), discrete-time (DT) signals, transformations of independent variable, Elementary Signals -Unit Step function, Unit Ramp function, Unit impulse function, exponential and sinusoidal signals, CT & DT systems, Basic system properties

Linear Time–Invariant (LTI) Systems: DT-LTI systems-representation of DT signals in terms of impulses, DT unit impulse response and the Convolution sum representation of LTI systems; CT-LTI systems- representation of CT signals in terms of impulses, CT unit impulse response and the Convolution integral representation of LTI systems; Properties of LTI systems, LTI systems described by differential and difference equations

Self-Learning Topics (SLTs): *Signal addition, Signal multiplication [Ref1: topic 1.4.5, topic 1.4.6], Solved problems:[Text1: Examples 1.1, 1.2,:2.2,2.3,2.6.2.7],Practice problems: [Text1: Problems 2.1 to .5,2.22,2.28.2.29]*

UNIT-II	**9 Hrs**

Continuous Time Fourier Series(CTFS) : Introduction **,** Response of LTI systems to complex exponentials, Linear combination of harmonically related complex exponentials ,Determination of the CTFS representation of periodic signals , Fourier spectrum, Convergence of CTFS, Properties of CTFS, Parseval's relation for CT periodic signals

Discrete-Time Fourier Series (DTFS): Fourier series representation of DT periodic signals, Properties of DTFS, Fourier series and LTI systems

Self-Learning Topics(SLTs): *Trigonometric Fourier series from exponential Fourier series, Cosine Fourier Series from Exponential Fourier Series, [Ref1: topic4.7.2, 4.7.3], Solved problems:[Text1:Examples 3.3 to 3.5], Practice problems:[Text1:Problems: 3.1 to 3.4, 3.22, 3.31]*

UNIT-III	**9 Hrs**

Continuous Time Fourier Transform (CTFT) : Fourier transform representation of CT Aperiodic signals , Convergence of CTFT , Magnitude and phase representation of Fourier transform, CTFT for periodic signals , Properties of CTFT , Parseval's relation, Systems characterized by linear constant–coefficient differential equations (LCCDE)

Discrete Time Fourier Transform (DTFT) : Fourier transform representation of DT Aperiodic signals ,

DTFT Convergence, DTFT for periodic signals, Properties of DTFT , Systems characterized by linear constant–coefficient difference equations (LCCDE)

Self-Learning Topics(SLTs): *Fourier transforms of Triangular pulse, Cosine wave, Sine wave [Ref1: topic5.5.9,5.5.10,5.5.11,5.6.15],Solved problems:[Text1: Examples 4.15, 4.22, 4.25,Ref1 5.5.9, 5.5.10, 5.5.11, 5.6.15].Practice problems: [Text1 Problems:4.1,4.2,4.6,4.23]*

UNIT-IV	**9 Hrs**

Laplace Transforms: Introduction, Region of convergence, Properties, Analysis and characterization of LTI systems using Laplace transforms, Systems characterized by linear constant–coefficient differential equations (LCCDE), Inverse Laplace transforms, Block diagram representation of causal LTI systems

Circuit analysis using Laplace transform: Step and impulse responses of series R-L, R-C & R-L-C circuits

Self-Learning Topics (SLTs): *Hyperbolic sine and cosine functions, Damped sine and cosine functions, Damped hyperbolic sine and cosine functions [Ref 1: topic 9.6.8, 9.6.9, 9.6.10] ,Solved problems: [Text19.14,9.15,9.23,9.24,9.25 ,Ref1 9.6.8,9.6.9,9.6.10],Practice problems:[Text1 : 9.17, 9.18,9.22,Ref: Exercise9:Problems:1,7,10,11]*

Course Learning Outcomes (COs):*After completion of this course, the students should be able to….*

CO1: classify CT and DT signals & systems and perform convolution for finding response of an LTI system to any arbitrary signal

CO2: determine the CTFS and DTFS representation of periodic signals and plot the frequency spectrum

CO3: evaluate CTF of standard signals and apply properties of CTFT for characterizing systems defined by LCCDE

CO4: compute Laplace Transform of standard signals and apply the properties of Laplace transforms for circuit analysis

Textbook(s):

1. Alan Oppenheim and Alan S.Willsky with S. Hamid Nawab, *Signals & Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2010. (Chapters 1, 2, 3, 4,5,9)

Reference Books:

1. A. Anand Kumar, *Signals and Systems*, 3rd ed., New Delhi: PHI, 2013.
2. Simon Haykin and Barry Van Veen, *Signals & Systems*, 2nd ed., Wiley India , 2008.
3. B.P.Lathi, *Signals Systems and Communication*, BS Publications, 2003.

Web and Video link(s):

1. https://archive.nptel.ac.in/courses/108/106/108106163/:NPTEL Video lecture on Signals and Systems by Prof. Kushal K. Shah, Department of Electrical Engineering& computer science/IISER Bhopal

2. https://archive.nptel.ac.in/courses/108/104/108104100/: NPTEL Video Lecture on Principles of Signals and Systems by Prof. Aditya k. Jagannatham, Department of Electrical Engineering/ IIT Kanpur

Course Articulation Matrix (CAM):		**U24MH301C:MATHEMATICAL FOUNDATIONS FOR SIGNAL PROCESSING**												
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	**U24MH301C.1**	2	2	1	1	-	-	-	1	1	-	1	2	2
CO2	**U24MH301C.2**	2	2	1	1	-	-	-	1	1	-	1	2	2
CO3	**U24MH301C.3**	2	2	1	1	-	-	-	1	1	-	1	2	2
CO4	**U24MH301C.4**	2	2	1	1	-	-	-	1	1	-	1	2	2
U24MH301C		2	2	1	1	-	-	-	1	1	-	1	2	2

SENSORS AND ACTUATORS			
Class: B.Tech. III -Semester		**Branch: ECIE**	
Course Code:	**U24CI302**	**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: classification of sensors & actuators and transduction principles of pressure sensors
LO2: transduction principles of level & flow sensors
LO3: working principle of mechanical energy based and Magnetic field based sensors & actuators
LO4: working principle of electric field based sensors & actuators and working principle smart sensors & transmitters

THEORY COMPONENT

UNIT-I	9 Hrs

Sensors and Actuators: Importance of sensors and actuators, Domain of physical phenomena, Classification of sensors and actuators, Importance of 4-20mA signal transmission in industrial applications

Pressure Sensors: Manometers; Elastic Transducers - Thin plate diaphragms, Bellows, Bourdon tube; Mcleod gauge, Pirani thermal conductivity gauge, Ionization gauge

Self Learning Topics (SLTs): *Dead weight tester(Text1: topic 11.4.2), Practice problems (Text1: Prob 11.5 to 11.8), Practice problems (Text1:Prob17.4)*

UNIT-II	9 Hrs

Level Sensors: Float gauges, Purge method, Buoyancy method; Level Probes - Resistive, Capacitive and Inductive types; Ultrasonic level gauge, Nucleonic level gauge, RF based level sensor

Flow Sensors: Flow sensors classification, Variable head meters, Variable area meter, Pitot-static tube, Differential pressure transmitter (DPT), Turbine flow meter, Ultrasonic flow meter, Electromagnetic flow meter, Hot wire anemometer

Miscellaneous sensors: Hydrometer, Viscosity sensor, pH sensor, Humidity sensor

Self Learning Topics (SLTs): *Laser doppler anemometer (Text1: topic 13.6.2), Practice problems (Text1: 13.5 to 13.12)*

UNIT-III	9 Hrs

Mechanical Energy based Sensors and Actuators: Piezoelectric accelerometer; Fluid actuators- Pneumatic actuators, Hydraulic actuators

Magnetic field based Sensors and Actuators: Hall effect sensor, Magnetostrictive torque sensor, Servo motor, Stepper motor, Electromagnetic relay, Solenoid

Self Learning Topics (SLTs): *Angular displacement sensor (Text2: topic 3.4.1)*

UNIT-IV	9 Hrs

Electric field based Sensors and Actuators: Capacitive acceleration sensor, Angular velocity

sensor (Gyroscope), Capacitive fingerprint sensor, Electrostatic loudspeaker, Electrostatic MEMS actuator

Smart Sensors and Transmitters: Micro sensors, Smart sensors, IC based sensors, I-P and P-I converters, 4-20 mA two-wire transmitter, Importance of P&I diagrams in industry applications

Self Learning Topics (SLTs): *Micro & nanotechnology (Text2: topic 2.2.2 to 2.2.5), Smart transmitters and field bus (Text1: topic 18.3,18.4), Practice problems (Text1: Prob 18.1)*

LABORATORY COMPONENT

List of Experiments

1. Basic Programming in LabVIEW
2. Programs on Sub VI's and Repetition and Loops
3. Programs on Arrays and Matrices
4. Programs on Strings, File I/O
5. Reading and writing an analog signal using NI-DAQ device
6. Strain measurement using NI DAQ and LabVIEW
7. Distancemeasurement using NI DAQ and LabVIEW
8. Acceleration measurement using NI DAQ and LabVIEW
9. Level measurement using NI DAQ and LabVIEW
10. Temperature measurement and control using NI DAQ and LabVIEW
11. Speed control using NI DAQ and LabVIEW
12. Pressure measurement using NI DAQ and LabVIEW

Textbook(s):

2. B C Nakra (Late) & K K Chaudhry, "*Instrumentation, Measurement and Analysis*", 4th ed. New Delhi, McGraw Hill Education (India) Pvt. Ltd.,2017. *(Chapters 11,13,17&18)*
3. Francisco André Corrêa Alegria,"*Sensors and Actuators*", World Scientific Publishing Co. Pte. Ltd., 2022. *(Chapters 1,2,3,5,6 &12)*

Reference Books:

1. D.V.S. Murthy, "*Transducers and Instrumentation*",Prentice Hall of India, 2nd ed., New Delhi, 2012.
2. Franklyn W. Kirk&Thomas A. Weedon Philip Kirk"*Instrumentation and Process Control*", American Technical PublishersInc.USA, 6th ed., 2014.
3. B.G. Liptak, "*Process Measurement and Analysis - Instrument Engineers' Hand Book*", CRC press, 4th ed., 2003.
4. AlokBarua, "*Fundamentals of Industrial Instrumentation*", Iop Publishing Ltd.,2nd ed., 2024.

Web and Video link(s):

1. *https://archive.nptel.ac.in/courses/108/105/108105064/;Industrial Instrumentation by Prof.AlokBarua, Professor of EEE, IIT Kharagpur*

Laboratory Manual (for laboratory component):

1. *Sensors and ActuatorsLaboratory Manual,* Department of ECIE, 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 different types of sensors & actuators based on the physical phenomena and select pressure sensors for industrial measurement applications

CO2: select level & flow sensors for industrial measurement applications

CO3: illustrate the sensing & actuation principles of mechanical energy based & magnetic field based devices

CO4: illustrate the sensing & actuation principles of electric field based devices and make use of smart sensors, transmitters, P&I diagrams for industrial applications

(based on psychomotor skills acquired from laboratory component)

CO5: interface distance sensors with NI DAQ hardware for accurate signal acquisition

CO6: acquire skills in interfacing distance sensors with NI DAQ hardware

CO7: apply learned concepts to real-world industrial temperature monitoring and control scenarios

CO8: analyze distance data and interpret measurement trends effectively

Course Articulation Matrix (CAM):		**U24CI302: SENSORS AND ACTUATORS**												
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	**U24CI302.1**	2	2	2	1	2	1	1	-	1	-	1	2	2
CO2	**U24CI302.2**	2	2	2	1	2	1	1	-	1	-	1	2	2
CO3	**U24CI302.3**	2	2	2	1	2	1	1	-	1	-	1	2	2
CO4	**U24CI302.4**	2	2	2	1	2	1	1	-	1	-	1	2	2
CO5	**U24CI302.5**	2	2	2	1	2	1	1	2	2	1	1	2	2
CO6	**U24CI302.6**	2	2	2	1	2	1	1	2	2	1	1	2	2
CO7	**U24CI302.7**	2	2	2	1	2	1	1	2	2	1	1	2	2
CO8	**U24CI302.8**	2	2	2	1	2	1	1	2	2	1	1	2	2
U24CI302		2	2	2	1	2	1	1	2	1.5	1	1	2	2

ANALOG INTEGRATED CIRCUITS AND APPLICATIONS

Class: B.Tech. III -Semester		**Branch:** ECI	
Course Code:	**U24CI303**	**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: principles, characteristics, and building blocks of operational amplifier (Op-Amp)
LO2: linear and non-linear applications of operational amplifiers
LO3: active filters using Op-Amps and operation of IC 555 timer & its applications
LO4: operation of phase locked loop, voltage regulators and data converters

THEORY COMPONENT

UNIT-I **9 Hrs**

Integrated Circuits (ICs): Introduction, Classification of ICs

Operational Amplifier (Op-Amp): Building blocks of Op-Amp, Analysis of basic inverting and non-inverting amplifier configurations, Voltage follower

DC & AC Characteristics of Op-Amp: DC Characteristics: Input offset voltage, Input bias current; Input offset current, Total output offset voltage, Thermal drift, Supply voltage rejection ratio (SVRR), Common mode rejection ratio (CMRR); AC Characteristics: Open loop and closed loop frequency response, Stability of Op-Amp, Slew rate, Ideal and practical characteristics of Op-Amp IC μA 741

Self-Learning Topics (SLTs): *Fabrication process of IC (Text1: topic 1.6), Differential amplifiers - balanced & unbalanced (Text1: topics 2.4), Practice problems (Text2: Problems 2.6 to 2.14)*

UNIT-II **9 Hrs**

Linear Applications of Op-Amp: Summing and difference amplifiers, Integrator, Differentiator, Voltage to current converter, Current to voltage converter, Instrumentation amplifier, Sample and hold circuit

Non-linear Applications Op-Amp: Precision rectifiers–half and full wave rectifiers, Logarithmic amplifier

Comparators and Waveform Generators: Op-Amp comparator, Regenerative comparator (Schmitt Trigger), and Wien's bridge oscillator

Self-Learning Topics (SLTs): *Anti-log amplifier (Text1: topic 4.8), Solved problems (Text1: Problems 4.14)*

UNIT-III **9 Hrs**

Active Filters: Introduction, Ideal and realistic frequency responses of various filters, Analysis and design of first order filters: Low pass, High pass, Band pass and Band stop, IGMF general configuration

IC 555 Timer: Introduction, Functional diagram, Design of astable and monostable multivibrators using 555timer, Applications of astable multivibrator - FSK generator, Pulse position modulation, Schmitt trigger; Applications of monostable multivibrator - Linear ramp generator

Self-Learning Topics (SLTs): *Second order low & high pass filters (Text1: topic 7.2), Applications of IC 555 Timer: Missing pulse detector, Pulse-width modulation (Text1: topics 8.3, 8.4), Solved problems (Text1: Prob 8.5)*

UNIT-IV	9 Hrs

Voltage Regulators: Basic voltage regulator using Op-Amps, General purpose IC regulator, μA723 - Functional diagram, Specifications, Three terminal voltage (fixed) regulators- General features and IC series of three terminal regulators

Data Converters: DAC types – Weighted resistor, R-2R ladder; ADC types - Flash, Successive approximation and Dual slope

Phase Locked Loops (PLLs) (Qualitative treatment only): Voltage controlled oscillator, Basic PLL operation, Definitions related to PLL, PLL application – FSK and AM detectors

Self-Learning Topics (SLTs): *Design of low & high voltage regulators (Text1: topics 6.2, 6.3), Weighted resistor (Text1: topics 10.2)*

LABORATORY COMPONENT

List of Experiments

1. V-I characteristics of P-N junction diode and Zener diode
2. Diode rectifiers without & with C, L and Π filters
3. I/O Characteristics of BJT in Common Emitter (CE) Configuration
4. Design and testing of single stage RC coupled amplifier
5. Design and testing of voltage series feedback amplifier using BJT
6. Design and testing of RC phase shift oscillator using BJT
7. Design and testing of Adder and Subtractor circuits using IC 741
8. Design and testing of differentiator using IC 741
9. Design and testing of integrator using IC 741
10. Design and testing of Wien's bridge oscillator using IC 741
11. Design and testing of astable multivibrator using IC 555
12. Design and testing of second order active low pass filter using IC 741

Textbook(s):

1. D. Roy Choudhury and Shail B Jain, *Linear Integrated Circuits*, 4th ed., New Delhi: New Age International, 2010.

Reference Book(s):

6. Ramakant Gayakwad, *Op-Amps and Linear Integrated Circuits*, 4th ed., New Delhi: Pearson Education, 2015.
7. George B. Clayton, *Linear Integrated Circuits and Applications*, London: The Macmillan Press Ltd., 1975.
8. Rodert F. Coughlin and Frederick F. Driscoll, *Operational Amplifiers and Linear Integrated Circuits*, 6th ed., New Delhi: Pearson Education, 2000.
9. S. Salivahanan and V S Kanchana Bhaskaran, *Linear Integrated Circuits*, 3rd ed., Chennai: McGraw Hill Education (India) Pvt. Ltd., 2019.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc23_ee65/preview; *NPTEL Video Lecture on Op-amp practical application: Design, Simulation and Implementation by Prof. Hardik J Pandya, Department of Electronic Systems Engineering, IISc Bangalore.*

Laboratory Manual (for laboratory component):

2. *Analog Integrated Circuits and Applications Laboratory Manual and Record Book*, Department of ECIE, 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 performance characteristics of Op-Amp IC 741
CO2: design Op-amp based linear & non-linear circuits
CO3: analyze the frequency response of Op-amp based active filters
CO4: design IC 723 based voltage regulators and data converters

(based on psychomotor skills acquired from laboratory component)

CO5: analyze the V-I characteristics of diodes and design rectifier circuits without & with filters
CO6: design and test the functionality of BJT amplifiers and oscillators
CO7: design and test the functionality of Op-Amp circuits such as adders, subtractors, differentiators & integrators
CO8: design and test the functionality of oscillators & multivibrators

Course Articulation Matrix (CAM):		**U24CI303 ANALOG INTEGRATED CIRCUITS AND APPLICATIONS**												
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	**U24CI303.1**	2	2	1	1	1	1	1	1	1	-	1	1	1
CO2	**U24CI303.2**	2	2	1	1	1	1	1	1	1	-	1	1	1
CO3	**U24CI303.3**	2	2	1	1	1	1	1	1	1	-	1	1	1
CO4	**U24CI303.4**	2	2	1	1	2	2	1	1	1	-	1	1	1
CO5	**U24CI303.5**	2	2	1	1	3	1	1	2	2	1	1	2	2
CO6	**U24CI303.6**	2	2	1	1	2	2	1	2	2	1	1	2	2
CO7	**U24CI303.7**	2	2	1	1	1	2	1	2	2	1	1	2	2
CO8	**U24CI303.8**	2	2	1	1	1	2	1	2	2	1	1	2	2
U24CI303		**2**	**2**	**1**	**1**	**1.5**	**1.5**	**1**	**1.5**	**1.5**	**1**	**1**	**1.5**	**1.5**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

DIGITAL CIRCUITS AND LOGIC DESIGN

Class: B.Tech. III -Semester		**Branch:** ECIE	
Course Code:	**U24CI304**	**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, Boolean algebra and minimization techniques
LO2: design and implementation of combinational circuits
LO3: analysis and design of sequential circuits
LO4: PLDs and operation of logic families

UNIT-I	**9 Hrs**

Number Systems and Codes: Number systems-representation, Conversion, Binary arithmetic, 1's and 2's complement subtraction; Binary Codes-Weighted binary codes, Self-complementing codes, Non-weighted Codes

Boolean Algebra and Minimization: Boolean algebra- Postulates and theorems, Logic gates, minimization and realization of switching functions ; Standard SOP & POS forms, Karnaugh maps-minimization of three and four variable functions, Quine–McClusky technique- Minimization of four and five variable functions

Self Learning Topics (SLTs) :*Binary representation of signed numbers (Text1: topics 1.6), Error correction and detection (Text1: topics 3.9 ,7.4),Practice problems (Text1: Example 2.2, 2.3)*

UNIT-II	**9 Hrs**

Combinational circuits: Half adder, Full adder, Half subtractor, Full subtractor, Parallel adder, Serial adder, Carry look ahead adder, BCD adder, Decoders, Encoders, Priority encoders, Multiplexers, Demultiplexers, Realization of switching functions using multiplexers and decoders

Self Learning Topics (SLTs): *- 1's & 2's complement adder/subtractor (Text1: topics 4.5),BCD to 7 segment decoder and code converters (Text1: topics 4.4), parity generators (Text1: topics 3.8),comparators (Text1: topics 4.8)*

UNIT-III	**9 Hrs**

Sequential circuits: Flip flops -SR, JK, D and T, Direct inputs, Race around condition , Master slave flip flop ; Binary counters – Design of asynchronous (ripple) and synchronous counters; Shift registers – Modes of operation, Ring and Johnson counters

Synchronous sequential circuits: State table, State diagram, State assignment, Design of synchronous sequential circuits - Counters , Sequence detectors

Self Learning Topics (SLTs) : *Conversion of one flip flop to other (Text1: topics 5.4),bidirectional and universal Shift register (Text1: topics 6.2)*

UNIT-IV	**9 Hrs**

Programmable logic devices (PLDS): Introduction to PLDs, Read only memories (ROMs), Programmable logic array devices (PLAs), Programmable array logic devices (PALs), Implementation
of Boolean functions on PLDs

Logic families : Introduction to logic families, Characteristics, Study of RTL, TTL, ECL and MOS families (Qualitative analysis)

Self Learning Topics (SLTs): *MOS structure (Text1: topics 10.7), Combinational circuit implementation (Ref.3: topic 8.4), Solved problems on ROM implementation (Ref.3: Example 8.1, 8.2, 8.3).*

Course Learning Outcomes (COs):

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

CO1: apply Boolean algebra, K-Maps and QM method to minimize logic functions
CO2: design combinational circuits using logic gates
CO3: design synchronous sequential circuits using flip-flops
CO4: design logic circuits using PLDs and analyze transfer characteristics of logic families

Textbook(s):

1. M. Morris Mano, *Digital Design*, 5th ed., New Delhi: PHI, 2013.

Reference Books:

1. Zvi Kohavi, *Switching and Finite Automata Theory*, 2nd ed., New Delhi: Tata McGraw-Hill, 2008.
2. R.P. Jain, *Modern Digital Electronics*, 3rd ed., New Delhi: Tata Mc Graw-Hill,2003.
3. A. Anand Kumar, *Fundamentals of Digital Circuits*, ,3rd ed., New Delhi: PHI, 2014.
4. Herbert Taub and Donald Schilling, *Digital Integrated Circuits*, New Delhi: Tata McGraw-Hill, 2008.

Web and Video link(s):

1. https://www.youtube.com/watch?v=yLP0vFSbCLg ; *NPTEL Video Lecture on Number Systems*
2. https://www.youtube.com/watch?v=Y5yprWIPDps ; *NPTEL Video Lecture on Binary codes by Prof Chandan Karla ,IIT Guwahati*
3. https://www.youtube.com/watch?v=CeD2L6KbtVM ; *NPTEL Video Lecture on Digital Circuits and Systems by Prof. S. Srinivasan, Professor of Electrical Engineering, IIT, Madras*.

Course Articulation Matrix (CAM) :		U24CI304 DIGITAL CIRCUITS AND LOGIC DESIGN												
CO		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	U24CI304.1	2	2	1	1	1	1	-	1	1	-	2	2	2
CO2	U24CI304.2	2	2	1	1	1	1	-	1	1	-	2	2	2
CO3	U24CI304.3	2	2	2	2	1	1	-	1	1	-	2	2	2
CO4	U24CI304.4	2	2	2	2	1	1	-	1	1	-	2	2	2
U24CI304		**2**	**2**	**1.5**	**1.5**	**1**	**1**	**-**	**1**	**1**	**-**	**2**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Class: B.Tech. III –Semester		**Branch:** Common to All	
Course Code:	**U24CI305**	**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 programming constructs
LO2: classes, methods and strings
LO3: inheritance, dynamic method dispatch, interfaces and packages
LO4: exception handling, I/O and multi-threading

THEORY COMPONENT

UNIT-I	**9 Hrs**

Programming Paradigms: Procedural programming, Modular programming, Object oriented programming (OOP), Generic programming

Java Basics: The History and evolution of Java, An overview of java, Data types, Variables and arrays, Operators, Control statements

Introducing Classes: Class fundamentals, Declaring Objects, Object reference variables, Introducing Methods

Self Learning Topics (SLTs): *Lexical Issues like Keywords, identifiers, Literals and comments (TextBook-Chapter 2), Type conversions and casting (TextBook-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

Self Learning Topics (SLTs): *Overloading Vararg Methods, Varargs and Ambiguity(TextBook-Chapter: 7), Anonymous Inner classes(TextBook-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, Interfaces can be extended

Packages: Defining a package, Packages and Member Access, Importing packages

Self Learning Topics (SLTs): *Accessing Implementations Through Interface References*, *Default interface methods, Use static Methods in an Interface, private interface methods (TextBook-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 statements, *throw*, *throws*, *finally, Creating your own exception sub classes.*

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

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

LABORATORY COMPONENT

List of Experiments

Experiment-I:

1. Develop a java program to demonstrate different operators in java.
2. Develop a java program to demonstrate control structures.
3. Develop a java program to demonstrate *switch* statement.

Experiment-II:

1. Develop a java program to read an array and display them using *for-each* control. Finally display the sum of array elements.
2. Develop a java program to read a matrix and display whether it is an identity matrix or not. Use *civilizedform* of *break* statement.
3. Develop a java program to define a two dimensional (2D) array where each row contains different numberof columns. Display the 2D-array using *for-each*.

Experiment-III:

1. Develop a java program to demonstrate class concept
2. Develop a java program to demonstrate *this*keyword
3. Develop a java program to demonstrate object reference variable
4. Develop a java program to demonstrate overloading of methods
5. Develop a java program to demonstrate passing and returning objects

Experiment-IV:

1. Develop a java program to demonstrate variable length argument (using array and ellipsis notation).
2. Develop a java program to demonstrate constructors and garbage collection.
3. Develop a java program to demonstrate nested and inner classes.
4. Develop a java program to demonstrate *static*variables, *static*methods, and*static*blocks.

Experiment-V:

1. Read at least five strings from command line argument and display them in sorted order.
2. Develop a java program to demonstrate wrapper class by reading N number of integers from command line and display their sum.
3. Develop a java program to demonstrate wrapper class by reading N floating point numbers from command line and display their average.

Experiment-VI:

1. Develop a java program to accept a string, count number of vowels and remove all vowels.
2. Develop a java program to accept a string, count number of vowels and remove all vowels using *StringBuffer*class**.**
3. Develop a java program to accept a line of text, tokenize the line using *StringTokenizer* class and print the tokens in reverse order.

Experiment-VII:

1. Develop a java program to demonstrate single level-inheritance.
2. Develop a java program to demonstrate multilevel-inheritance using super.
3. Develop a java program to demonstrate method overriding.

Experiment-VIII:

1. Develop a java program to demonstrate dynamic method dispatch.
2. Develop a java program to demonstrate use of abstract class.
3. Develop a java program to demonstrate the use of overriding *equals()* method of an Object class.

Experiment-IX:

1. Develop a java program to implement interfaces.
2. Develop a java program to extend the interfaces
3. Develop a java program to demonstrate implementation of nested interfaces.

Experiment-X:

1. Develop a java program to create a *package* and demonstrate to import the *package* into any java program (Consider the behavior of all access specifiers).

Experiment-XI:

1. Develop a java program to demonstrate *try-catch* block.
2. Develop a java program to demonstrate *throw* clause.

3. Develop a java program to demonstrate *throws* clause.

4. Develop a java program to demonstrate *re-throw* an exception, and *finally* block.

Experiment-XII:

1. Develop a java program to demonstrate read/write/copy a file using *byte stream*.

2. Develop a java program to demonstrate read/write/copy a file using *character stream*.

3. Develop a java program to create a thread (using *Thread*class or *Runnable* interface).

4. Develop a java program to demonstrate *synchronization* of threads.

5. Develop a java program to demonstrate *Interthreadcommunication*.

Textbook(s):

1. Herbert Schildt, *Java The Complete Reference*, 13th ed. New Delhi: McGraw Hill, 2024

Reference Book(s):

10. Balaguruswamy, *Programming with Java: A Primer*, 7th ed. New Delhi: McGraw Hill, 2023

11. KathySierra and BertBates, *Head First Java*, 2nd ed. Boston: O'Reilly Media, 2005

12. Harvey Deitel and Paul J. Deitel, *Java How to Program,* 11th ed. New Delhi: Pearson, 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):

3. *Object Oriented Programming through java Manual and Record Book,* Department of ECIE, 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 strengths and limitations of various programming paradigms to determine their suitability for solving various programming problems in java

CO2: develop java programs using classes, constructors, methods and various string concepts

CO3: apply reusability concepts like inheritance, dynamic method dispatch, interfaces and packages to build java programs

CO4: develop java programs using I/O, file handling, exception handling and multithreading concepts

(based on psychomotor skills acquired from laboratory component)

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

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

CO7*:* build java programs on inheritance, dynamic method dispatch, interfaces and packages

CO8*:* develop java programs using I/O, exception handling and multithreading concepts

Course Articulation Matrix (CAM):		U24CI305: 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	U24CI305.1	2	2	2	-	1	-	-	-	-	-	1	1	1
CO2	U24CI305.2	2	2	2	1	2	-	-	1	-	-	1	1	1
CO3	U24CI305.3	2	2	3	2	1	-	-	-	-	-	1	1	1
CO4	U24CI305.4	2	2	3	2	2	-	-	1	-	-	1	1	1
CO5	U24CI305.5	1	1	1	1	1	-	-	1	1	-	1	1	1
CO6	U24CI305.6	1	2	2	2	2	-	-	1	1	-	1	1	1
CO7	U24CI305.7	1	2	3	2	2	-	-	1	1	-	1	1	1
CO8	U24CI305.8	1	2	3	2	2	-	-	1	1	-	1	1	1
U24CI305		**1.5**	**1.87**	**2.37**	**1.5**	**1.62**	**-**	**-**	**1**	**1**	**-**	**1**	**1**	**1**

QUANTITATIVE APTITUDE AND LOGICAL REASONING

Class: B.Tech. III -Semester		**Branch:** Common to all Branches	
Course Code:	**U24VA306A**	**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

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

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 Articulation Matrix (CAM):		**U24VA306A 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	**U24VA306A .1**	1	2	-	1	-	-	-	-	-	-	1	1	1
CO2	**U24VA306A.2**	1	2	-	1	-	-	-	-	-	-	1	1	1
CO3	**U24VA306A.3**	-	1	-	2	-	2	-	-	-	-	1	1	1
CO4	**U24VA306A.4**	-	1	-	2	-	2	-	-	-	-	1	1	1
U24VA306A		**1**	**1.5**	**-**	**1.5**	**-**	**2**	**-**	**-**	**-**	**-**	**1**	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PRACTICUM-3

Class: B.Tech. III-Semester	**Branch:** Common to all branches		
Course Code:	**U24EL308**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-0-4-4**	**CIE:**	**100%**
Total Number of Teaching Hours:	**-**	**ESE :**	**-**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: literature review and identifying research gaps

LO2: implementing a project independently by applying knowledge to practice

LO3: preparing well-documented report and informative PPT

LO4: effective technical presentation and creating video pitch

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

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

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

(iii). Allotment of Practicum topics for students:

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

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

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

(Signature of class teacher)

****

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

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

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

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

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

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

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

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

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

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

(q) **Report:** Each student is required to submit a well-documented report on the allotted practicum topic as per the format specified by the course faculty. The student shall include answers to the following questions in the report and ppt presentation.

- What was the objective of the practicum assigned?
- What are the main responsibilities and tasks for practicum?
- What knowledge and skills from the 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?

(r) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

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

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

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

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 -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	**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														

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA-3 /SAA-3)			
Class: B.Tech. III -Semester	**Branch:** Common to all branches		
Course Code:	**U24VA309**	**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.

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

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

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

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

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

Monitoring SEA/SAA:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Eminent personalities/ Achievers / Renowned personalities:

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

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

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

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

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

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

xxvii. For the fieldwork, student shall go with a scientifically designed questionnaire and record the responses during interaction. These response sheets, along with geo-tagged pic of fieldwork (at the time of interaction & practise sessions, if any)

shall be appended as annexures in the report to be submitted for course evaluation.

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

- During feedback, the central focus is on the elaboration of the students' 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.

(l) **Demonstration / Presentation and Report**: Student after presentation/demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit and submit a report, in the prescribed format, to the faculty counsellor for award of grade.

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

xi. ***Faculty counsellor approval***: In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

xii. ***Identification of goals and preparation of action plan:*** In week (1), the respective faculty coordinator(s) of nodal centres shall address the students allotted to them to educate them on fixing goals, plan of action for completion and evaluation. In consultation with nodal centre, based on the workflow of the allotted activity, every student shall identify the goals (of activity) & eminent personalities (to be visited during the field trip) and prepare action plan (oriented workflow) for attaining the identified goals.

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

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

xv. ***Report writing:*** After successful demonstration/presentation, student shall write a 2–3-page report and submit the same to the faculty counsellor. The report shall emphasize knowledge, skills and qualities acquired through the SEA/SAA

activities. It shall also include the influence of these activities on enhancing confidence, positive change in life, decision making, transforming choices into desired actions/outcomes.

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

The CIE for SEA/SAA is as follows:

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

Note:

(f) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation 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 semesters.

Course Learning Outcomes (COs):

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

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

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

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

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

Text / Reference book(s):

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

Course Articulation Matrix (CAM):		**U24VA309- SEA-3/ SAA-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	**U24VA309.1**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO2	**U24VA309.2**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO3	**U24VA309.3**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO4	**U24VA309.4**	-	-	-	-	-	2	2	2	2	2	2	1	1
U24VA309		-	-	-	-	-	2	2	2	2	2	2	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

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

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

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

EXPERT TALK SERIES-3

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.

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

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

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

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

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

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

(v) Through Industry expert talks students get to know so much more 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-focussed curriculum URR24 is designed to contribute greatly to the nurturing and development of each of these facets among students through ETS courses

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

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

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

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

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

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

(ee) Salient features of ETS are hereunder:

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

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

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

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

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

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

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

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

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

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

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

(ff) The CIE for ETS is as follows:

Rubrics for evaluation of ETS

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

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

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

iv. Supplementary Exam:

(i) Student has to register for ETS supplementary examination if he/she scores less than 40 marks in CIE

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

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

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

Course Learning Outcomes (COs):

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

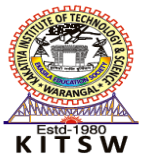
CO5: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO6: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

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

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

Course Articulation Matrix (CAM):		U24AE310 EXPERT TALK SERIES-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	U24AE310.1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE310.2	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE310.3	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE310.4	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE310		**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**



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)
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Semester -IV Syllabi

IV SEMESTER

S. No.	Category	Course Code	Course Title	Lectures / week					Credits
				L	T	P	O	E	C
1	PCC	U24CI401	VLSI Design	2	1	2	5	10	4
2	PCC	U24CI402	Digital Signal Processing	2	1	2	5	10	4
3	PCC	U24CI403	Electromagnetic Theory and Wave Propagation	2	1	-	4	7	3
4	PCC	U24CI404	Computer Architecture and Microprocessors	2	1	-	4	7	3
5	ESC	U24CI405	Python Programming	2	1	2	5	10	4
6	VAC	U24VA406B	Soft and Interpersonal Skills@	-	-	2	2	4	1
7	SEC	U24SE407	Programming Skill Development Lab – 3 (Java)	-	-	2	2	4	1
8	ELC	U24EL408	Practicum-4	-	-	-	4	4	1
9	VAC	U24VA409XX XXX	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	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)				-	-	-	-	-	-

For Lateral Entry Students Only

@U24VA306 T & P Basket		
S. No.	**Course Code**	**Course Title**
1.	U24VA406A	Quantitative Aptitude and Logical Reasoning *(for Stream II)*
2.	U24VA406B	Soft and Interpersonal Skills *(for Stream I)*

VLSI DESIGN

Class: B.Tech. IV -Semester		**Branch:** ECI	
Course Code:	**U24CI401**	**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: fabrication process and electrical properties of MOS transistors
LO2: stick diagrams, design rules, layout diagrams and basic circuit concepts of MOS transistors
LO3: scaling and subsystem design with structured approach
LO4: basic concepts of Verilog and description of various levels of abstraction

THEORY COMPONENT

UNIT-I — 9 Hrs

Introduction to MOS Technology: Introduction to VLSI, Basic MOS transistor, Process steps in fabricating MOSFET, Fabrication process of nMOS, CMOS and BiCMOS transistors

Basic Electrical Properties of MOS Circuits: Drain to source current and voltage relation, Threshold voltage, Transconductance, Pass transistor, nMOS inverter, Pull up/pull down ratios, Alternate forms of pull up, CMOS inverter, BiCMOS inverter, Latch-up in CMOS circuits

Self Learning Topics (SLTs): *Introduction to IC Technologies (Text1: chapter 1, topics 1.1, 1.2), Comparison between CMOS and bipolar technologies (Text1: chapter 1, topics 1.10)*

UNIT-II — 9 Hrs

MOS Circuit Design Processes: MOS layers, Stick diagrams - nMOS design style and CMOS design style, Lambda based design rules and layout diagrams

Basic Circuit Concepts: Sheet resistance, Area capacitances of layers, Delay unit, Inverter delays, Rise time and fall time estimation

Self Learning Topics (SLTs): *Examples of nMOS stick diagram to realize a function (Text1: chapter 3, topics 3.2.1), Area capacitance calculation (Text1: chapter 4, topics 4.5), Driving large capacitive loads (Text1: chapter 4, topic 4.8)*

UNIT-III — 9 Hrs

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters and limitations of scaling

Subsystem Design and Layout: Architectural issues, Switch logic, Gate logic, Examples of structured design, Clocked sequential circuits and system considerations

Self Learning Topics (SLTs): *Equations of MOSFET parameters (Text1: chapter 5, 5.2), Electro-optical interconnection (Text1: chapter 5, 5.3.3), Practice problems on stick diagrams of gate logic (Text1: chapter 6, topic 6.8)*

UNIT-IV — 9 Hrs

Verilog HDL: Hierarchical modeling concepts, Basic concepts - Data types, Modules and ports, Gate level modeling, Dataflow modeling, Behavioral modeling, Design examples of combinational and sequential circuits, Switch level modeling, Tasks and functions

Self Learning Topics (SLTs): *Stimulus block (Text2: chapter 2, 2.6.2), Practice programs on structural modelling (Text2: chapter 4, 4.5), Practice programs on gate level modeling (Text2: chapter 5, 5.4)*

LABORATORY COMPONENT

List of Experiments

1. Realization of logic functions using universal gates
2. Implementation of Full adder and Full Subtractor using multiplexer/demultiplexer
3. Realization of Boolean functions using using Decoders
4. Implementation of 4-bit Asynchronous counter using flipflops
5. Design, layout and simulation of CMOS NOT circuit
6. Design, layout and simulation of CMOS NAND circuit
7. Design, layout and simulation of CMOS NOR circuit
8. Design, layout and simulation of CMOS circuit for a given Boolean function
9. Design and simulation of 4-bit Adder using Verilog HDL
10. Design and simulation of flip-flops (SR, D, JK & T) using Verilog HDL
11. Design and simulation of 4-bit shift register using Verilog HDL
12. Design and simulation of 4-bit counter using Verilog HDL

Textbook(s):

1. Douglas A Pucknell and Kamran Eshraghian, *Basic VLSI Design*, 3rd ed., New Delhi: PHI, 2008. *(Chapters 1 to 6)*

2. Samir Palnitkar, Peter Flake, *Verilog HDL – Guide to Digital Design and Synthesis*, 3rd ed., New Delhi: Pearson Education, 2003. *(PART-I: Chapters 2 to 8)*

Reference Book(s):

1. Neil H. E. Weste, David Harris and Ayan Banerjee, *CMOS VLSI Design – A Circuits and Systems Perspective*, 3rd ed., New Delhi: Pearson Education, 2005.

2. John P Uyemura, *Chip Design for Submicron VLSI: CMOS Layout and Simulation*, 2nd ed., Thomson/Nelson, 2010.

Web and Video link(s):

https://archive.nptel.ac.in/courses/108/107/108107129/ ; *NPTEL Video Lecture on CMOS Digital VLSI Design by Prof. Sudeb Dasgupta, Professor of ECE, IIT Roorkee.*

https://archive.nptel.ac.in/courses/106/105/106105165/ ; *NPTEL Video Lecture on Hardware modeling using verilog by Prof. Indranil Sengupta, Professor of CSE, IIT Kharagpur.*

Laboratory Manual (for laboratory component):

1. *VLSI Design Laboratory Manual and Record Book*, Department of ECIE, 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 transfer characteristics of CMOS inverter circuits and determine pull up/pull down ratios

CO2: develop stick diagrams & mask layouts using design rules and estimate the sheet resistance, area capacitances of layers & time delays of MOS transistors

CO3: determine the scaling factors for various device parameters and apply the structured design approach for example circuits

CO4: develop Verilog code for digital circuits using behavioral, dataflow, gate and switch levels of abstraction

(based on psychomotor skills acquired from laboratory component)

CO5 : design combinational and sequential circuits using logic gates and flip flops

CO6 : develop the layouts for digital CMOS VLSI circuits

CO7 : test the functionality of digital circuits using Verilog HDL

CO8 : utilize the Electronic Computer Aided Design (ECAD) tools for simulation and verification of VLSI circuits

Course Articulation Matrix (CAM):		**U24CI401:VLSI 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	**U24CI401.1**	2	2	2	2	-	-	1	-	1	1	1	2	2
CO2	**U24CI401.2**	2	2	2	2	-	-	1	-	1	1	1	2	2
CO3	**U24CI401.3**	2	2	2	2	-	-	1	-	1	1	1	2	2
CO4	**U24CI401.4**	2	2	2	2	-	-	1	-	1	1	1	2	2
CO5	**U24CI401.5**	2	2	2	2	2	-	1	2	2	2	1	2	2
CO6	**U24CI401.6**	2	2	2	2	2	-	1	2	2	2	1	2	2
CO7	**U24CI401.7**	2	2	2	2	2	-	1	2	2	2	1	2	2
CO8	**U24CI401.8**	2	2	2	2	2	-	1	2	2	2	1	2	2
U24CI401		**2**	**2**	**2**	**2**	**2**	**-**	**1**	**2**	**1.5**	**1.5**	**1**	**2**	**2**

DIGITAL SIGNAL PROCESSING

Class: B.Tech. IV -Semester		**Branch: ECIE**	
Course Code:	**U24CI402**	**Credits:**	**4**
Hours/Week (L-T-P-O-E):	**2-1-2-5-10**	**CIE Marks (%):**	**60**
Total Number of Teaching Hours:	**60 Hrs**	**ESE Marks (%):**	**40**

Course Learning Objectives (LOs):

This course will develop students' knowledge in /on…

LO1: Z-Transform, characterization of LTI systems and realizations of IIR systems
LO2: DFT, computational complexity and efficient implementation of DFT using FFT
LO3: design of IIR & FIR filters
LO4: correlation, basic theory of adaptive signal processing and its applications

THEORY COMPONENT

UNIT-I — **9 Hrs**

Z-Transform: Representing DT signals by complex exponentials, Definition of *z*-transform, Region of convergence (ROC), Properties of *z*-transform, Inverse *z*-transform by partial fractions and long division methods, Analysis and characterization of LTI system using *z*-transform

Block Diagram Representations: Structures for IIR systems - Direct, cascade and parallel form realizations of IIR systems

Self Learning Topics (SLTs): *Inverse z transform by contour integration [Text1: topic 3.4.1], Solved problems:[Text1:Examples3.1.4,3.1.5,3.2.2,3.4.1,9.3.1],Practice problems [Text1: Problems3.3,3.4, 3.14 3.25 ,9.9]*

UNIT-II — **9 Hrs**

Discrete Fourier Transform (DFT): Fourier Transform of DT aperiodic signals, Frequency domain sampling and reconstruction of discrete-time signals, DFT, properties of DFT, Circular convolution, Inverse DFT (IDFT), Frequency analysis of signals using DFT Relation between DFT, DTFT and Z-transform

Fast Fourier Transform (FFT): Computational complexity of DFT, Introduction to FFT, Radix-2 FFT algorithms, Decimation-in-time FFT algorithm, Decimation-in-frequency FFT algorithm, Inverse DFT using FFT algorithms

Self Learning Topics (SLTs):*DFT as linear transformation, Symmetry property of DFT:[Text1:topi 7.1.3.7. 2.1], Solved problems:[Text1:Examples 7.1.3, 7.2.1],Practice problems (Text1:Problems7.2 7.11,8.11*

UNIT-III — **9 Hrs**

Finite Impulse Response (FIR) filters: Design of linear phase FIR filters - rectangular window, triangular window, hamming window & Hanning window

Infinite Impulse Response (IIR) Filters: Design of IIR digital filters from analog filter specifications, Mapping techniques - Impulse invariance and bilinear transformation; IIR digital filter design using Butterworth and Chebyshev approximations, Frequency transformations

Self Learning Topics (SLTs): *frequency sampling method (Text1: topic 10.2.3),Solved problems:[Text1:Examples 10.3.3.10.3.4,],Practice problems (Text1: Problems 10.2.1)*

UNIT-IV	**9 Hrs**

Correlation: Correlation of discrete time signals, Auto correlation, Properties of auto correlation function, Cross correlation, Matrix form representation, Example problems for computation of correlation functions

Adaptive Filters: Concepts of adaptive filtering, configurations, Basic wiener filter theory, Cost function, Error performance surface, Basic LMS algorithm & its implementation, Practical limitations of basic LMS algorithm, RLS algorithm, Limitations of RLS algorithm

Applications of Adaptive filters: Fetal monitoring - Cancelling of maternal ECG during labor; Adaptive telephone echo cancellation.

Self Learning Topics (SLTs): *Applications of Adaptive Filters (Text2: topic 9.8); Example problems (Text2: Example 9.1,9.2,9.3)*

LABORATORY COMPONENT

List of Experiments

Develop a MATLAB Program to

1. Generate elementary DT Signals
2. Perform scaling, shifting and delay operations on the sequences
3. Perform the Correlation and Convolution of two sequences
4. Compute DFT and 4-pt FFT
5. Observe the spectrum of a given signal
6. Characterize LTI system using Z-transform (impulse response, poles and zeros, frequency response and linear phase characteristics)
7. Design Butterworth IIR Filters to meet the given specifications
8. Design Chebyshev IIR filters to meet the given specifications.
9. Design FIR Filters using windows
10. Remove Power line interference (PLI) from ECG signal using Notch filters
11. Perform modulation and demodulation of Amplitude Modulation (AM)
12. Perform up/down sampling

Textbook(s):

1. John G.Proakis & D.G.Manolakis, *Digital Signal Processing: Principles, Algorithms and Applications*, 4th ed. New Delhi: Pearson education, 2007. (Chapters 3, 7, 8,9,10)
2. Ifeachor, *Digital Signal Processing-A practical Approach,* 4th ed. New Delhi: Pearson Education, 2013. (Chapter 09)

Reference Books:

1. A.V. Oppenheim & R. W. Schafer, *Discrete-Time Signal Processing*, 2nd ed., New Delhi: PHI, 1999.

2. Sanjit K. Mitra, *Digital Signal Processing – A Computer Based Approach*, 2nd ed., New Delhi: TMH, 2002.
3. Johnny R. Johnson, *Introduction to Digital Signal Processing*, 1st ed., New Delhi: PHI, 2001.
4. Adreas Antanio, *Digital filter Analysis and Design*, 4th ed., New Delhi: *TMH,* 1988.

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc24_ee16/preview; *Digital Signal Processing and its Applications by Prof. V. M. Gadre, Professor of EEE, IIT Bombay*

Laboratory Manual (for laboratory component):

4. *Signal processing and applications Laboratory Manual,* Department of ECIE, 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 LTI systems using z-transform and realize the DT systems

CO2: compute 2, 4 & 8-point DFT using radix2 DIT & DIF algorithms

CO3: design a linear-phase FIR and IIR digital filters for the given specifications

CO4: analyze the performance of LMS & RLS algorithms and utilize adaptive filters for noise cancellation applications

(based on psychomotor skills acquired from laboratory component)

CO5 : simulate DT signals and perform operations on the sequences

CO6 : analyze the spectrum of a given signal using FFT algorithms

CO7 : design IIR and FIR digital filters

CO8 : design a digital filter for biomedical and communication applications

Course Articulation Matrix (CAM):		**U24CI402: DIGITAL SIGNAL PROCESSING**													
CO		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	**U24CI402.1**	2	2	3	2	3	1	-	2	2	1	2	1	2	2
CO2	**U24CI402.2**	2	2	3	2	3	1	-	2	2	1	2	1	2	2
CO3	**U24CI402.3**	3	2	3	2	3	1	-	2	2	1	2	1	2	2
CO4	**U24CI402.4**	3	2	3	2	3	1	-	2	2	1	2	1	2	2
CO5	**U24CI402.5**	2	2	3	2	3	1	1	1	2	1	2	1	2	2
CO6	**U24CI402.6**	2	2	3	2	3	1	1	1	2	1	2	1	2	2
CO7	**U24CI402.7**	3	2	3	2	3	1	1	1	2	1	2	1	2	2
CO8	**U24CI402.8**	3	2	3	2	3	1	1	1	2	1	2	1	2	2
U24CI402		**2.5**	**2**	**3**	**2**	**3**	**1**	**1**	**1.5**	**2**	**1**	**2**	**1**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW															

ELECTROMAGNETIC THEORY AND WAVE PROPAGATION

Class: B. Tech. IV -Semester		**Branch:** ECI	
Course Code:	**U24CI403**	**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: vector algebra and electric field due to charge distribution
LO2: magnetic field due to current distribution
LO3: wave propagation in different medium
LO4: field components in rectangular waveguides

UNIT-I	**9 Hrs**

Review of Vector analysis: Vector algebra, Del operator, Gradient, Divergence, Curl, Coordinate Systems- Cartesian**,** Cylindrical and Spherical, Stoke's theorem and Divergence theorem.

Electrostatics: Coulomb's law and field intensity, Electric fields due to continuous charge distributions, Electric flux density, Gauss's law, Application of Gauss's law, Electric potential, Relation between E and V, Energy density in electrostatic fields, Poisson's and Laplace's equations, Capacitance – Parallel-plate, Coaxial, and Spherical Capacitor, Boundary conditions

Self Learning Topics (SLTs): *An Electric dipole and flux lines (Text1: topic 4.9), Polarization in dielectrics (Text1: topic 5.5), Solved problems (Text1: Prob 4.2, Prob 4.3, Prob 4.4, Prob 4.5)*

UNIT-II	**9 Hrs**

Magnetostatics: Biot-Savart's law, Ampere's circuit law, Magnetic flux density, Magnetic scalar and vector potentials

Magnetic fields in materials: Forces due to magnetic fields, Magnetic torque and moment, Magnetic dipole, Magnetic boundary conditions

Time-varying fields: Faraday's law, Displacement current, Maxwell's equations in point & integral forms, Time varying potentials

Self Learning Topics (SLTs): *Applications of Ampere's law(Text1: topics 7.4), Solved problems (Text1: Prob 7.4, Prob 7.5, Prob 7.7), Magnetization in materials (Text1: topic 8.5)*

UNIT-III	**9 Hrs**

Electromagnetic waves: Wave propagation in free space, dielectric, and good conductor, Skin effect, Wave polarization

Power flow: Poynting's theorem, Time average pointing vector & power flow in an electromagnetic wave

Reflection & Transmission of plane waves: Reflection of a plane wave at normal incidence & oblique incidence

Self Learning Topics (SLTs): *Waves in general (Text1: topics 10.2), Solved problems (Text1: Prob 10.1, Prob 10.2, Prob 10.3, Prob 10.8)*

UNIT-IV	**9 Hrs**

Waveguides: Rectangular waveguides – Field components in TE & TM mode propagation, Impossibility of TEM mode in rectangular waveguides, Characteristics of rectangular waveguide

Antenna Fundamentals: Types of antennas – Hertzian dipole, Half wave dipole antenna, Small loop antenna, Antenna characteristics

Self Learning Topics (SLTs): *Power transmission and attenuation(Text1: topic 12.6), Solved problems (Text1: Prob 12.1, Prob 12.2, Prob 12.3), Practice problems (Text1: Prob 12.3), Quarter – wave monopole antenna (Text1: topic 13.4) , Solved problems (Text1: Prob 13.1, Prob 13.2)*

Course Learning Outcomes (COs):

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

CO1: determine the electric field at any given point due to charge distribution
CO2: apply Biot-Savart's law and Ampere's law for determining magnetic field intensity
CO3: analyze the wave propagation in different medium
CO4: determine the field components in rectangular waveguides

Textbook(s):

1. Mathew N.O. Sadiku, *Principles / Elements of Electromagnetics*, 4th ed., London: Oxford University Press, 2014.

Reference Book(s):

1. W. H. Hayt, J. A. Buck, *Engineering Electromagnetics*, 7th ed., The McGraw-Hill Companies, 2006.
2. Edward C. Jordan, Keith G. Balmain, *Electromagnetic Waves and Radiating Systems*, 2nd ed., New Delhi: Prentice Hall of India, 2001.
3. Nathan Ida, *Engineering Electromagnetics*, 3rd ed., USA: Springer, 2015.

Web and Video link(s):

1. https://youtu.be/G5P6dInMTFg?si=XSb5gcfFt1hFXMrx; *NPTEL Video Lecture on Electromagnetic Theory, Prof. Pradeep Kumar, Professor of Electrical Engineering, IIT Kanpur.*
2. https://youtu.be/pGdr9WLto4A?si=csgylBeDiTJpG6_z; *NPTEL Video Lecture on Electromagnetic Theory, by Prof. Harishankar Ramachandran, Professor of Electrical Engineering, IIT Madras.*

Course Articulation Matrix (CAM):		**U24CI403 ELECTROMAGNETIC THEORY AND WAVE PROPAGATION**												
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	**U24CI403.1**	3	2	1	1	-	-	1	-	1	1	1	1	2
CO2	**U24CI403.2**	3	2	1	1	-	-	1	-	1	1	1	1	2
CO3	**U24CI403.3**	3	2	1	1	-	-	1	-	1	1	1	1	2
CO4	**U24CI403.4**	3	2	1	1	-	-	1	-	1	1	1	1	2
U24CI403		**3**	2	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**1**	**1**	**1**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

COMPUTER ARCHITECTURE AND MICROPROCESSORS

Class: B.Tech. IV -Semester		**Branch:** Common to all branches	
Course Code:	**U24CI404**	**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 computer design and its programming
LO2: CPU, memory & IO organization of computer
LO3: architectural features of 8086 microprocessor
LO4: programming concepts of 8086 microprocessor

UNIT-I	**9 Hrs**

Introduction: Organization and Architecture, History of computers, Block diagram of a digital computer, Register transfer language, Bus and memory transfers

Basic Computer Design: Instruction codes, Computer registers, Common bus system, Computer instructions

Programming Computer: Machine language, Assembly language, Programming arithmetic and logical operations

Central Processing Unit: General register organization, Stack organization, Instruction formats, Addressing modes, Data transfer and manipulation, Program control

Microprogrammed Control: Control memory, Address sequencing

Self-Learning Topics (SLTs): *Instruction cycle (Text1: unit 5, topic 5.5), Memory reference instructions (Text1: unit 5, topic 5.6), Subroutines (Text1: unit 6, topic 6.7), Input-Output programming (Text1: unit 6, topic 6.8), Microprogram example (Text1: unit 7, topic 7.3), RISC vs CISC (Text1: unit 8, topic 8.8)*

UNIT-II	**9 Hrs**

Computer Arithmetic: Addition and subtraction, Multiplication and division algorithms, Floating point representation

Input-Output Organization: Peripheral devices, IO interface, Asynchronous data transfer, Modes of IO transfer, Priority interrupt, DMA memory access

Memory Organization: Memory hierarchy, Main memory, Auxiliary memory, Associative memory, Cache memory

Self-Learning Topics (SLTs): *Floating point arithmetic operations (Text1: unit 10, topic 10.5), Serial communication (Text1: unit 11, topic 11.8), Virtual memory (Text1: unit 12, topic 12.6), Memory management hardware (Text1: unit 12, topic 12.7)*

UNIT-III	**9 Hrs**

8086 Family Architecture: Organization of 8086 CPU, Concept of memory segmentation, Segment registers, Physical and logical addressing, Addressing modes, Instruction set

Self-Learning Topics (SLTs): *Instruction formats (Text2: unit 3, topic 3.2.)*

UNIT-IV	**9 Hrs**

Assembly Language Programming: Assembler directives, Simple programming of 8086, Arithmetic, Logical and Data processing programs; Implementation of control loops, Strings

Self-Learning Topics (SLTs): *Structures (Text2: unit 5, topic 5.2), Procedures & Macros (Text2: unit 5, topic 5.4)*

Course Learning Outcomes (COs):

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

CO1: design basic elements of a microcomputer's CPU such as common buses, registers, arithmetic logic unit (ALU) & control unit

CO2: classify memory and IO transfer methods in microcomputers

CO3: examine architectural and programming features of 8086 microprocessor

CO4: develop assembly language programs (ALPs) to solve data processing problems

Textbook(s):

1. M. Morris Mano, Gibson, *Computer System Architecture,* 3rd ed., New Delhi: Pearson Education Inc., 1993. (Chapters 3 to 12)
2. Yuchang Liu and Glen A. Gibson, *Microcomputer Systems - The 8086/8088 Family Architecture, Programming and Design,* 2nd ed., New Delhi: PHI, 1995. (Chapters 2 to 5)

Reference Book(s):

1. W. Stallings, *Computer Architecture and Organization – Designing for Performance,* 7th ed., New Delhi: Pearson Education Inc., 2007
2. B. Ram, Sanjay Kumar, *EComputer fundamentals: Architecture and Organization,* 5th ed., New Delhi: New Age International Publishers, 2018.
3. D.V.Hall, *Microprocessors and Interfacing: Programming & Hardware*, 2nd ed., New Delhi: Tata McGraw Hill, 1992.

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc23_cs67/preview *NPTEL Course on Computer Architecture* by *Prof. Smruti Ranjan Sarangi, IIT Delhi.*
2. https://archive.nptel.ac.in/courses/106/105/106105163/ *NPTEL Video Lecture on Computer Architecture and Organization by Prof. Indranilsen Gupta and Prof. Kamalika Datta, IIT Kharagpur.*
3. https://onlinecourses.nptel.ac.in/noc20_ee11/preview *NPTEL Course on Microprocessors and Interfacing by Prof. Shaik Rafi Ahamed, IIT Guwahati.*

Course Articulation Matrix (CAM):		**U24CI404 COMPUTER ARCHITECTURE & MICROPROCESSORS**												
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	**U24CI404.1**	2	2	1	1	-	-	1	-	1	-	1	2	2
CO2	**U24CI404.2**	2	2	1	1	-	-	1	-	1	-	1	2	2
CO3	**U24CI404.3**	2	2	1	1	-	-	1	-	1	-	1	2	2
CO4	**U24CI404.4**	2	2	1	1	-	-	1	-	1	-	1	2	2
U24CI404		**2**	**2**	**1**	**1**	**-**	**-**	**1**	**-**	**1**	**-**	**1**	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PYTHON PROGRAMMING

Class: B.Tech. IV -Semester		**Branch:** Common to All	
Course Code:	**U24CI405**	**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: operators, control statements, functions and iterators of Python programming

LO2: namespaces, modules, collections, string handling methods and regular expressions

LO3: object-oriented programming, files and database connectivity

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

Functions: Function definition, Function call, Variable scope and lifetime, the return statement, Advances in defining in functions, Recursive functions, Lambda functions, Iterators, Decorators, Generators

Self Learning Topics (SLTs): *Installing Python, Testing and Debugging (Text1: Chapter 3 Anexure-1&2), Operator Precedence and Associativity (Text1: topic 3.12.10),* The else statement used with loops *(Text1: topic 4.8), Document Strings(Text1: topic 5.8)*

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, Comprehensions, High order functions

Self Learning Topics (SLTs): Standard library modules *(Text1: topic 5.13), in & not in operator (Text1: topic 6.7), Variable-length Argument Tuples(Text1: topic 8.4.13), The zip() Function (Text1: topic 8.4.14), String formatting with Dictionaries (Text1: topic 8.6.10)*

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, Class methods, Static methods, Inheritance, Meat classes, Polymorphism, Operator overloading, Magic Methods

Error and Exception handling: Introduction to errors and exceptions, Handling exceptions, Multiple except blocks, Raising exception, Instantiating exceptions, Built-in and User-defined Exceptions,

The finally Block, Re-raising exceptions, Assertions, *Multi threading*

File Handling: Opening and closing files, Reading and writing files, File positions, Renaming and deleting files, Directory methods

Database Connectivity: SQLite, creating a database table, Insert and retrieve data from database

Self Learning Topics (SLTs): *Calling class method from another class method (Text1: topics 9.10), Built in class variables (Text1: topic 9.12), Garbage Collection (Text1: topic 9.13), Complex objects (Text1: topic 10.4), Multiple Exceptions in a Single Block (Text1: topic 12.4), Handling exceptions in Invoked Function(Text1: topic 12.9)*

UNIT-IV	9 Hrs

NumPy: The basics of NumPy arrays, Array indexing, Array slicing, Reshaping of array, Concatenation and splitting arrays, Aggregations, Universal Functions, Broad casting of Arrays

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, Vectorized String Operations, Working with Time Series

Visualization with Matplotlib: Importing Matplotlib, Saving figures to files, Simple line plots, Simple scatter plots, Histograms, Binnings, and density, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap

Self Learning Topics (SLTs): *Sorting array, Structured array operations (Text2: Chapter 2 topics), Rearranging Multi-Indices, Pivoting table (Text2: Chapter 3 topics),* Visualizing errors, Density and Contour plots, Customizing color bars*(Text2: Chapter 4 topics)*

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. Develop a Python program to demonstrate importance of indentations. Purposefully raise indentation error and correct it
4. Develop a Python program to take input text as command line argument and display it on screen

Experiment-II

1. Develop a Python program that takes 2 numbers as command line arguments and print its sum
2. Develop a Python program to check whether the given number is even or odd
3. Develop a Python program to calculate GCD of 2 numbers

4. Develop a Python program to find Exponentiation (Power) of a number
5. Develop a Python program to find given year is leap year or not
6. Develop a Python program to develop a simple calculator

Experiment-III

1. Develop a Python program to find the Factorial of a given number
2. Develop a Python program to find the Armstrong for a given number
3. Develop a Python program to take a number as input, and print countdown from that number to zero (use while loop)
4. Develop a Python program to demonstrate Iterators
5. Develop a Python program to demonstrate Decorators
6. Develop a Python program to demonstrate Generators

Experiment-IV

1. Develop a Python program to implement a module using import statement (Use python source file as a Module and implement import statement another python source files)
2. Develop a Python program to implement from, import statement
3. Develop a Python program to implement dir() function
4. Develop a Python program to demonstrate packages in python

Experiment-V

1. Develop a Python python program on strings for the following
2. To display substring in a string
3. To update an existing string
4. To implement string concatenation
5. To demonstrate string formatting operator
6. Develop a Python program to demonstrate use of slicing in strings
7. Develop a Python program to compare two strings
8. Reverse string and call this function for performing the operation)
9. Develop a Python program to demonstrate regular expression functions
10. Develop a Python program to demonstrate regular expressions using Meta characters

Experiment-VI

1. Develop a Python program to demonstrate list and related functions

2. Develop a Python program to demonstrate tuple and related functions
3. Develop a Python program to demonstrate set and related functions
4. Develop a Python program to demonstrate dictionaries
5. Develop a Python program to demonstrate comprehensions
6. Develop a Python program to demonstrate high order functions

Experiment-VII

1. Develop a python program to demonstrate classes and objects
2. Develop a python program to demonstrate class method
3. Develop a python program to demonstrate static method
4. Develop a python program to demonstrate inheritance
5. Develop a python program to demonstrate polymorphism
6. Develop a python program to demonstrate magic methods.

Experiment-VIII

1. Develop a python program to demonstrate multiple exception handling
2. Develop a python program to demonstrate multiple exception rising
3. Develop a python program to demonstrate multiple finally block
4. Develop a python program to demonstrate Assertions
5. Develop a python program on file operations for the following
6. To open and read data from a file
7. To write data into a file
8. To compute number of characters, words, lines in a file

Experiment-IX

1. Develop a python programs to implement database connectivity
2. Install and verify SQLite Connector for Python
3. To connect check SQLite Database connectivity
4. To retrieve and display data from a table
5. To insert data into a table
6. To delete rows in a table

Experiment-X

1. Develop a Python program to demonstrate NumPy array
2. Develop a Python program to demonstrate Slice operation
3. Develop a Python program to demonstrate Reshaping of an array
4. Develop a Python program to demonstrate Ufunctions
5. Develop a Python program to demonstrate Broadcasting of numpy arrays
6. Develop a Python program to demonstrate Aggregate operations

Experiment-XI

1. Develop a Python pandas program to create a series from a ndarray
2. Develop a Python pandas program to create a series from input files
3. Develop a Python pandas program to demonstrate indexing and slicing data frames
4. Develop a Python pandas program to demonstrate handling missing values
5. Develop a Python pandas program to demonstrate vectorized string operations,
6. Develop a Python pandas program to demonstrate handling time series data

Experiment-XII

1. Develop a Python program to draw a simple line plot
2. Develop a Python program to draw a scatter plots
3. Develop a Python program to draw a histogram plot
4. Develop a Python program to draw a binning and density
5. Develop a Python program to demonstrate a three dimensional plotting
6. Develop a Python program to demonstrate a geographic basemap

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: O'Reilly Media, 2016 (*Chapter 2 to 4*)

Reference Book(s):

1. Dr. Charles R. Severance, *Python for Everybody-Exploring Data Using Python*, 1st ed. New Delhi: Shroff Publishers, 2016
2. David Beazley, *Python Cookbook*, 3rd ed. California: O'Reilly Media, Inc., 2013
3. Caleb Hattingh, *20 Python Libraries You Aren't Using*, 2nd ed. California: O'Reilly Media, 2016

4. Magnus Lie Hetland, *Beginning Python: from Novice to Professional*, 1st ed. New York: Apress, 2005

Web and Video link(s):

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

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

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

Laboratory Manual (for laboratory component):

1. *Python Programming Laboratory Manual and Record Book,* Department of ECIE, 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 control statements, operators and functions

CO2: apply collections, namespaces, packages, strings and regular expressions in application development

CO3: apply object-oriented programming principles in real-time problem solving

CO4: develop visualization graphs with Matplotlib and apply Numpy and Pandas libraries for data analysis

(based on psychomotor skills acquired from laboratory component)

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

CO6: Implement and test python packages using string handling methods, regular expressions, and collections

CO7: implement and test object oriented paradigms and database operations in Python programming

CO8: build visualization graphs with Matplotlib and adapt packages like Numpy, Pandas for data analysis

Course Articulation Matrix (CAM): U24CI405: 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	U24CI405.1	1	2	2	2	2	1	-	-	-	1	1	2	2
CO2	U24CI405.2	2	2	2	2	2	1	-	-	-	1	1	2	2
CO3	U24CI405.3	2	2	2	2	3	1	-	-	-	1	1	2	2
CO4	U24CI405.4	2	2	2	2	3	1	-	-	-	1	1	2	2
CO5	U24CI405.5	1	2	2	2	2	1	1	1	1	1	2	2	2
CO6	U24CI405.6	2	2	2	2	2	1	1	1	1	1	2	2	2
CO7	U24CI405.7	2	2	2	2	3	1	1	1	1	1	2	2	2
CO8	U24CI405.8	2	2	2	2	3	1	1	1	1	1	2	2	2
U24CI405		**1.75**	2	**2**	2	**2**	1	1	1	1	1	1.5	2	2

SOFT AND INTERPERSONAL SKILLS LABORATORY

Class: B.Tech. III -Semester & IV-Semester		**Branch:** Common to all Branches	
Course Code:	**U24VA406B**	**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):		U24VS406B 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	U24VA406B.1	-	-	-	-	-	-	-	2	3	-	1	-	-
CO2	U24VA406B.2	-	-	-	-	-	-	2	3	3	-	1	-	-
CO3	U24VA406B.3	-	-	-	-	-	-	-	2	3	-	1	-	-
CO4	U24VA406B.4	-	-	-	-	-	-	1	2	3	-	1	-	-
U24VA406B		-	-	-	-	-	-	1.5	2.25	3	-	1	-	-
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PRACTICUM-4

Class: B.Tech. IV-Semester	**Branch:** Common to all branches		
Course Code:	**U24EL408**	**Credits:**	**1**
Hours/Week (L-T-P-O-E):	**0-0-0-4-4**	**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).

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

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

(xii). Allotment of Practicum topics for students:

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

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

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

****

CIRCULAR

Allotment of Practicum topics to students

Section : …….

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

Note:

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

(Signature of class teacher)

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

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

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

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

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

(xviii). 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.

(v) **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.

(w) **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.

(x) **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?

(y) **Anti-Plagiarism Check:** The practicum report should clear plagiarism check as per the Anti-Plagiarism policy of the institute

(z) **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

(aa) **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

(bb) 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):		**U24EL408 PRACTICUM -4**											
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														

SOCIAL EMPOWERMENT ACTIVITY / SELF ACCOMPLISHMENT ACTIVITY (SEA-4 /SAA-4)

Class: B.Tech. IV -Semester	**Branch:** Common to all branches		
Course Code:	**U24VA409**	**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.

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

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

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

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

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

Monitoring SEA/SAA:

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

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

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

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

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

ix. 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.

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

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

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

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

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

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

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

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

Eminent personalities/ Achievers / Renowned personalities:

(a). **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.

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

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

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

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

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

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

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

- During feedback, the central focus is on the elaboration of the students' 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.

(s) **Demonstration / Presentation and Report**: Student after presentation/demonstration of his/her achievements/work, shall get a certificate from the concerned nodal unit and submit a report, in the prescribed format, to the faculty counsellor for award of grade.

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

xvi. ***Faculty counsellor approval***: In week (-1), in consultation with faculty counsellor, every student shall, identifies minimum of 4 activities listed under SEA/SAA activities, lists their priority and fills the same in ONLINE REGISTRATION FORM FOR SEA/SAA (received in their domain mail id) to Dean, Student Affairs. Dean, Student Affairs shall release the section wise allotment of SEA/SAA courses to students along with the details of supervising faculty of nodal centre. The allotment details shall be shared to the SEA/SAA coordinator and the student through domain mail id of the student

xvii. ***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.

xviii. ***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.

xix. ***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.

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

desired actions/outcomes.

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

The CIE for SEA/SAA is as follows:

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

Note:

(k) **Presentation/ Demonstration:** It is mandatory for the student to appear for demonstration and (or) oral presentation 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.

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

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

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

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

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

Course Learning Outcomes (COs):

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

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

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

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

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

Text / Reference book(s):

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

Course Articulation Matrix (CAM):		**U24VA409- SEA-3/ SAA-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	**U24VA409.1**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO2	**U24VA409.2**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO3	**U24VA409.3**	-	-	-	-	-	2	2	2	2	2	2	1	1
CO4	**U24VA409.4**	-	-	-	-	-	2	2	2	2	2	2	1	1
U24VA409		-	-	-	-	-	2	2	2	2	2	2	**1**	**1**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

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

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

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

EXPERT TALK SERIES-4

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.

(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:

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

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

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

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

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

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

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

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

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

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

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

(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**

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

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

v. 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…

CO9: identify real-world problems, different career paths, industry requirements, emerging job roles, business practices and exploit new opportunities by staying up-to-date with industry knowledge, trends and technology

CO10: identify what 21st century employability-related skills and professional etiquette are must in a range of recruitment situations, what skills are absent in him/her, and demonstrate skill improvement

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

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

Course Articulation Matrix (CAM):		**U24AE410 EXPERT TALK SERIES-4**												
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	U24AE410.1	1	1	1	1	1	1	2	1	2	1	2	1	1
CO2	U24AE410.2	1	1	1	1	1	1	2	1	2	1	2	1	1
CO3	U24AE410.3	1	1	1	1	1	1	2	1	2	1	2	1	1
CO4	U24AE410.4	1	1	1	1	1	1	2	1	2	1	2	1	1
U24AE410		**1**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	**1**	**1**

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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)
website: www.kitsw.ac.in E-mail: principal@kitsw.ac.in ✆ : +91 9392055211, +91 7382564888

II Year
Exit Courses
Syllabi

Bridge Courses for exit:

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

OR

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

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

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

Exit Options to Qualify for UG Diploma in ECIE: Any Two (02) Courses during the 2 - Months internship									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	PCC	U24CI412X	Introduction to Microcontrollers and Embedded Systems	2	-	2	-	4	3
2	PCC	U24CI413X	Fundamentals of Internet of Things	2	-	2	-	4	3
3	PCC	U24CI414X	Printed Circuit Board Design	2	-	2	-	4	3
4	PCC	U24CI415X	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 Options to Qualify for UG Diploma in ECIE: Any Two (02) Skill based Courses -:									
S. No.	Category	Course Code	Course Title	L	T	P	O	E	C
1	SEC	U24SE412XCI	Data Communication and Networking	-	-	6	-	6	3
2	SEC	U24SE413XCI	Electronics Servicing and Maintenance	-	-	6	-	6	3
3	SEC	U24SE414XCI	Advanced PCB Designing ntsc_hyd_detail_24082022_electronic.pdf (nsic.co.in)	-	-	6	-	6	3
4	SEC	U24SE415XCI	Android APP Development Microsoft Word - 5. SOFWARE I 2022-23_ENG_HINDI (nsic.co.in)	-	-	6	-	6	3
5	SEC	U24SE416XCI	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.

INTRODUCTION TO MICROCONTROLLERS AND EMBEDDED SYSTEMS

Class: B.Tech. IV Semester Exit Course		**Branch:** ECI	
Course Code:	**U24CI412X**	**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…

LO5: *architecture and addressing modes of 8051*

LO6: *microcontroller hardware units and interfacing keyboards, display with 8051*

LO7: *overall design issues related to hardware and software of an embedded system*

LO8: *basic functions of OS, multiprocessing and multitasking, task scheduling, synchronization*

THEORY COMPONENT

UNIT-I	**4 Hrs**

8051 Microcontroller: Architecture, Memory organization, Programming model, Addressing modes, Instruction set

UNIT-II	**4 Hrs**

8051 Microcontroller: I/O ports, Timers and counters, Serial data input and output, Microcontroller interfacing with keyboard & display Units (LED and LCD)

UNIT-III	**4 Hrs**

Embedded System: Introduction, Characteristics and components of an embedded system, Fundamental issues in hardware software co-design, Embedded firmware design approaches

UNIT-IV	**4 Hrs**

Real-Time Operating System (RTOS) based Embedded System Design: Operating system basics, Tasks, Process & threads, Multiprocessing and multitasking, Task scheduling, Task communication, Task synchronization

LABORATORY COMPONENT

List of Programs

1. ALPs / ECPs (Embedded C Programs) for implementing arithmetic operations (Multiplication, Division) on single and double precision binary data
2. ALP / ECP for searching largest number in an array
3. ALP / ECP for searching smallest number in an array
4. ALP / ECP for interfacing switches
5. ALP / ECP for matrix key board interfacing
6. ALP / ECP for interfacing LEDs
7. ALP / ECP for 7-Segment display interfacing
8. ALP / ECP for LCD interfacing
9. ALP / ECP for DAC interfacing
10. ALP / ECP for ADC interfacing

11. ALP / ECP for interfacing DC motor

12. ALP/ECP for interfacing stepper motor

Textbook(s):

1. Manish K Patel, *The 8051 Microcontroller Based Embedded Systems*, New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2014. *(Chapter 2 to 21)*
2. Shibu K V, *Introduction to Embedded Systems,* New Delhi: McGraw Hill Education (India) Pvt. Ltd., 2009. *(Chapter 1, 2, 5, 6, 7, 9 and 10)*

Reference Book(S):

1. Kenneth J. Ayala, *The 8051 Microcontroller*, 3rd ed., Noida: Cengage learning, 2007
2. Md. Ali Mazidi, Janice G Mazidi and Rolin D. McKinlay, *The 8051 Microcontroller and Embedded Systems Using Assembly and C*, 2nd ed., New Delhi: Pearson Education India, 2011.
3. Sriram V. Iyer & Pankaj Gupta, *Embedded Real Time Systems Programming*, New Delhi: TMH, 2003.

Web and Video link(s):

https://onlinecourses.nptel.ac.in/noc25_ee49/preview, NPTEL Video Lecture on *Microprocessors and Microcontrollers by Prof. Santanu Chattopadhyay IIT Kharagpur*

Laboratory Manual (for laboratory component):

1. *Microcontrollers and Embedded Systems laboratory manual and record book,* Department of ECIE, 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: identify the key architectural features of 8051 microcontroller
CO2: develop hardware and software for interfacing keyboards, display units
CO3: interpret design issues related to hardware and software of an embedded system
CO4: select appropriate task scheduling algorithms and solve synchronization issues

(based on psychomotor skills acquired from laboratory component)

CO5: develop arithmetic, logical & data processing algorithms using 8051 assembly language
CO6: develop algorithms for sorting using 8051assembly language
CO7: develop ALPs & ECPs for interfacing input output devices with 8051
CO8: develop ALPs & ECPs for interfacing data converters with 8051

Course Articulation Matrix (CAM):		U24CI412.X INTRODUCTION TO MICROCONTROLLERS AND EMBEDDED 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	U24CI412.X.1	1	1	2	1	2	-	1	-	1	-	1	2	2
CO2	U24CI412.X.2	1	1	2	1	2	-	1	-	1	-	1	2	2
CO3	U24CI412.X.3	1	1	2	1	2	-	1	-	1	-	1	2	2
CO4	U24CI412.X .4	1	1	2	1	2	-	1	-	1	-	1	2	2
CO5	U24CI412.X .5	1	1	2	1	2	-	1	2	2	1	1	2	2
CO6	U24CI412.X .6	1	1	2	1	2	-	1	2	2	1	1	2	2
CO7	U24CI412.X .7	1	1	2	1	2	-	1	2	2	1	1	2	2
CO8	U24CI412.X .8	1	1	2	1	2	-	1	2	2	1	1	2	2
U24CI412.X		1	1	2	1	2	-	1	2	1.5	1	1	2	2
3-High, 2-Medium, 1-Low														

FUNDAMENTALS OF INTERNET OF THINGS

Class: B.Tech. IV semester Exit course		**Branch:** ECI	
Course Code:	**U24CI413X**	**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…

LO9: fundamentals of IoT and domain specific IoT systems

LO10: IoT protocols and platform design methodology

LO11: IoT devices (*Arduino UNO and Node MCU boards*) and their programming

LO12: cloud computing for IoT

THEORY COMPONENT

UNIT-I	**4 Hrs**

Internet of Things (IoT): Introduction, Characteristics, Ecosystem, Layered structure, Reference model, Enabling technologies

Domain specific IoT systems: Home automation, Smart cities, Environment, Retail, Logistics, Agriculture

UNIT-II	**4 Hrs**

IoT Protocols: MQTT, XMPP, DDS, AMQP, COAP, REST

IoT platform design methodology: Procedural steps of IoT platform design methodology

UNIT-III	**4 Hrs**

Building blocks of Arduino device: Introduction to Arduino board and Node MCU board, Arduino boards architecture & pin diagram, Arduino board interfaces, Arduino based IoT interfacing circuits with sensors, actuators, LCD & LED display devices

Programming for IoT applications: Programming with IoT devices - Arduino, Node MCU; IoT applications - Controlling LED, Measurement of temperature and humidity using DHT sensor, Obstacle detection and distance measurement using ultrasonic sensor, Actuating alarm buzzer & push button switch, Controlling servo motor

UNIT-IV	**4 Hrs**

Cloud computing for IoT: Introduction to cloud computing, fog computing and edge computing; Cloud service models – SaaS, PaaS & IaaS; Cloud deployment models – Public, private, hybrid & community clouds; Cloud security, Introduction to ThingsBoard cloud platform

LABORATORY COMPONENT

List of Experiments

1. LED interface with Arduino UNO
2. LCD display interface with Arduino UNO
3. Relay interface with Arduino UNO
4. Varying brightness of LED with Arduino UNO
5. IR sensor interface with Arduino UNO
6. Servo motor interface with NodeMCU

7. Obstacle detection using NodeMCU
8. Pulse sensor interface with NodeMCU
9. Humidity and temperature measurement using NodeMCU
10. Remote monitoring of sensor data using Things board cloud

Textbook(s):

1. Srinivasa K.G. et al., *Internet of Things,* 2nd ed., Cengage Learning India Pvt. Ltd., 2019. (*Chapters 1, 3, 4, 5 & 7*)
2. S. Misra, A. Mukherjee, and A. Roy, *Introduction to IoT,* 1st ed., Cambridge University Press, 2020. (*Chapters 5, 10, 11, 12, 13, 14 & 16*)

Reference Book(s):

1. Bahga and V. Madisetti, *Internet of Things: A Hands-on Approach*, 1st ed., Universities Press (India) Pvt. Ltd., Reprint (2020), 2014.
2. Colin Dow, *Internet of Things Programming Projects*, Birmingham: Packt Publishing Pvt Ltd., 2018.
3. Bahga and V. Madisetti, *Cloud Computing: A Hands-on Approach*, 1st ed., Universities Press (India) Pvt. Ltd., Reprint (2022), 2014.

Web and Video link(s):

1. https://onlinecourses.nptel.ac.in/noc22_cs53/preview; NPTEL Video Lecture on *Introduction to Internet of Things* by Prof. Sudip Misra, *Professor of CSE,* IIT Kharagpur.

Laboratory Manual (for laboratory component):

1. *Fundamentals of IoT Laboratory Manual and Record Book,* Department of ECIE, 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: utilize IoT reference model & enabling technologies to develop domain specific IoT systems

CO2: identify IoT protocols and select appropriate design methodology to develop domain specific IoT systems

CO3: develop Arduino based programs for IoT applications

CO4: apply cloud computing concepts to develop IoT systems

(based on psychomotor skills acquired from laboratory component)

CO5: measure temperature, humidity & distance using NodeMCU

CO6: build LED & LCD interfacing circuits using Arduino UNO

CO7: build interfacing circuit for servo motor using NodeMCU

CO8: develop programs to store & retrieve the data using cloud

Course Articulation Matrix (CAM):		U24CI413X FUNDAMENTALS OF INTERNET OF THINGS												
CO		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO1	U24CI413X.1	2	1	1	1	-	-	1	1	1	-	1	2	2
CO2	U24CI413X.2	2	1	1	1	-	-	1	1	1	-	1	2	2
CO3	U24CI413X.3	2	1	1	1	1	-	1	1	1	-	1	2	2
CO4	U24CI413X.4	2	1	1	1	1	-	1	1	1	-	1	2	2
CO5	U24CI413X.5	1	1	2	1	2	1	1	2	2	1	1	2	2
CO6	U24CI413X.6	1	1	2	1	2	1	1	2	2	1	1	2	2
CO7	U24CI413X.7	1	1	2	1	2	1	1	2	2	1	1	2	2
CO8	U24CI413X.8	1	1	2	1	2	1	1	2	2	1	1	2	2
U24CI413X		**1.5**	**1**	**1.5**	**1**	**1.67**	**1**	**1**	**1.5**	**1.5**	**1**	1	**2**	**2**
3 – HIGH, 2 – MEDIUM, 1 - LOW														

PRINTED CIRCUIT BOARD DESIGN

Class: B.Tech. IV –Semester Exit course		**Branch:** ECI	
Course Code:	**U24CI414X**	**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: classification of Printed Circuit Boards (PCBs)
LO2: PCB layout techniques for optimized component density and power saving
LO3: etching and soldering techniques in PCB design
LO4: current trends in PCB industry

THEORY COMPONENT

UNIT-I	**4 Hrs.**

PCB Fundamentals: Introduction, Components of PCB, Electronic components, Microprocessors and microcontrollers, ICs, Surface Mount Devices (SMD); Classification of PCBs - Single-sided, Double-sided, Multilayer & flexible; Manufacturing of PCB, PCB standards

UNIT-II	**4 Hrs.**

Schematic and Layout Design: Schematic diagram, Design considerations, Placing and mounting of components, Conductor spacing, Routing guidelines, Heat sinks and package density, Net list, Creating components for a library, Tracks, Pads, Vias, Power plane, Grounding

UNIT-III	**4 Hrs.**

PCB Design Processes: Design automation, Design rule checking, Exporting drill and Gerber files, Drills, Footprints and libraries, Adding and editing pins, Copper-clad laminates, Properties of laminates (electrical & physical), Etching techniques, Lead cutting and soldering techniques

UNIT-IV	**4 Hrs.**

PCB Technology:
Introduction of PCB prototyping machines, Schematic entry, PCB parts creation, Auto routing, Post design, Brief overview of various models, Recent trends, Environmental concerns in the PCB industry

LABORATORY COMPONENT

List of Experiments

PCB layout design of

1. P-N junction diode circuit to study V-I characteristics
2. Full wave rectifier circuit with filters
3. Zener regulator circuit
4. CE amplifier circuit
5. Op-Amp integrator circuit
6. Astable multivibrator circuit using IC 555
7. Full adder circuit using NAND gates
8. Decade ripple counter using T-Flip flops

PCB Design Softwares recommended

1. KiCAD (Open-Source Electronics Design Automation Suite) https://www.kicad.org/
2. EasyEDA (Online PCB Design Tool) https://easyeda.com/
3. PADS - Siemens EDA (PCB Design Software) https://eda.sw.siemens.com/en-US/pcb/pads/

Textbook(s):

1. Walter C. Bosshart, *Printed Circuit Board – Design & Technology*, New Delhi: Tata McGraw- Hill, 2008.

Reference Book(S):

1. R.S. Khandpur, *Printed Circuit Board –Design, Fabrication, Assembly & Testing*, 1st ed., Tata McGraw-Hill, 2005.
2. Chris Schroeder, *Printed Circuit Board Design Using Autocad*, Newnes Publisher, 1998.
3. Clyde F. Coombs, Jr, Happy T. Holden, *Printed Circuits Handbook*, 6th ed., New Delhi: McGraw Hill, 2016.

Web and Video link(s):

1. https://youtube.com/playlist?list=PL_UUrUkFMWRXeJ2mKt5jidU5hId4gwY&si=VotSJBjFbp3LWMaV.

Laboratory Manual (for laboratory component):

1. *PCB Design and Fabrication laboratory manual and record book*, Department of ECIE, 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 PCBs

CO2: develop the schematic and layouts for PCB circuits

CO3: illustrate the PCB design and automation process

CO4: appraise the current trends in PCB design industry

(based on psychomotor skills acquired from laboratory component)

CO5: design **PCB** to test the functionality of full wave rectifier circuit

CO6: design **PCB** to test the functionality of Zener regulator circuit

CO7: design **PCB** to test the functionality of analog circuits

CO8: design **PCB** to test the functionality of digital circuits

Course Code: **U24CI414X** Course Name**: PRINTED CIRCUIT BOARD 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	**U24CI414X.1**	1	1	2	1	2	1	1	-	1	-	1	2	2
CO2	**U24CI414X.2**	1	1	2	1	2	1	1	-	1	-	1	2	2
CO3	**U24CI414X.3**	1	1	2	1	2	1	1	-	1	-	1	2	2
CO4	**U24CI414X.4**	1	1	2	1	2	1	1	-	1	-	1	2	2
CO5	**U24CI414X.5**	1	1	2	1	2	1	1	2	2	1	1	2	2
CO6	**U24CI414X.6**	1	1	2	1	2	1	1	2	2	1	1	2	2
CO7	**U24CI414X.7**	1	1	2	1	2	1	1	2	2	1	1	2	2
CO8	**U24CI414X.8**	1	1	2	1	2	1	1	2	2	1	1	2	2
U24CI414X		1	1	2	1	2	1	1	2	1.5	1	1	2	2