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Delhi-NCR, Ghaziabad

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Delhi-NCR, Ghaziabad-Meerut Road, Ghaziabad-201206

Course Booklet 1st year

CURRICULUM STRUCTURE & SYLLABUS

Version 1.0

Effective from the Session: 2024-25

Computer Science and Engineering (CSE)/Computer Science (CS)/ Computer Science and Information Technology (CSIT)/ Information Technology (IT)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices / Environmental Chemistry	3 2	0 0	0 0	3 2
3	ES	Programming For Problem Solving	3	0	0	3
4	PC	Discrete Structures & Theory of Logic/ Computer Organization & Logic Design	3	0	0	3
5	ES	IoT and Embedded Systems/ Design & Realization	2	0	0	2
6	ES	Design Thinking	1	0	0	1
Lab/Practical						
7	BS/PC	Semiconductor Physics and Devices Lab/ Computer Organization & Logic Design Lab	0	0	2	1
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	ES	IoT and Embedded Systems Lab/ Design & Realization Lab	0	0	2	1
10	PC	Web Designing Lab	0	0	2	1
11	HS	Communication Skills / Foreign Language	0	0	4	2
12	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
13	MC	Career Pathway*	0	0	2*	NC
14	MC	Ethics & Professional Competency*	0	0	2*	NC
			15	**1**	**16**	**23**

- **Design Thinking, IoT and Embedded Systems, Self-Growth, Indian Knowledge System and Web Designing Lab will be evaluated through activity-based assessments**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Linear Algebra for Engineers	3	1	0	4
2	BS	Environmental Chemistry / Semiconductor Physics and Devices	2 3	0 0	0 0	2 3
3	ES	Data Structure	3	0	0	3
4	PC	Computer Organization & Logic Design / Discrete Structures & Theory of Logic	3	0	0	3
5	ES	Design & Realization/ IoT and Embedded Systems	2	0	0	2
Lab/Practical						
6	PC/BS	Computer Organization & Logic Design Lab/ Semiconductor Physics and Devices Lab	0	0	2	1
7	ES	Data Structures Lab	0	0	2	1
8	ES	Design & Realization Lab/ IoT and Embedded Systems Lab	0	0	2	1
9	ES	Python for Engineers	0	0	4	2
10	HS	Foreign Language / Communication Skills	0	0	4	2
11	ES	Innovation and Entrepreneurship	0	0	2	1
12	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			13	**1**	**18**	**22**

- **IoT and Embedded Systems, Innovation and Entrepreneurship, Indian Knowledge System and Self Growth will be evaluated through activity-based assessments.**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3**

Computer Science & Engineering (AI)/ Computer Science & Engineering (AI & ML)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices / Environmental Chemistry	3 2	0 0	0 0	3 2
3	ES	Programming For Problem Solving	3	0	0	3
4	PC	Discrete Structures & Theory of Logic/ Computer Organization & Logic Design	3	0	0	3
5	ES	IoT and Embedded Systems/ Introduction to AI	2	0	0	2
6	ES	Design Thinking	1	0	0	1
Lab/Practical						
7	BS/PC	Semiconductor Physics and Devices Lab/ Computer Organization & Logic Design Lab	0	0	2	1
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	ES/PC	IoT and Embedded Systems Lab/ Introduction to AI Lab	0	0	2	1
10	PC	Web Designing Lab	0	0	2	1
11	HS	Communication Skills / Foreign Language	0	0	4	2
12	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
13	MC	Career Pathway*	0	0	2*	NC
14	MC	Ethics & Professional Competency*	0	0	2*	NC
			15	**1**	**16**	**23**

- **Design Thinking, IoT and Embedded Systems, Self-Growth, Indian Knowledge System and Web Designing Lab will be evaluated through activity-based assessments**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Linear Algebra for Engineers	3	1	0	4
2	BS	Environmental Chemistry / Semiconductor Physics and Devices	2 3	0 0	0 0	2 3
3	ES	Data Structure	3	0	0	3
4	PC	Computer Organization & Logic Design / Discrete Structures & Theory of Logic	3	0	0	3
5	PC/ES	Introduction to AI / IoT and Embedded Systems	2	0	0	2
Lab/Practical						
6	PC/BS	Computer Organization & Logic Design Lab/ Semiconductor Physics and Devices Lab	0	0	2	1
7	ES	Data Structures Lab	0	0	2	1
8	PC/ES	Introduction to AI Lab/ IoT and Embedded Systems Lab	0	0	2	1
9	ES	Python for Engineers	0	0	4	2
10	HS	Foreign Language / Communication Skills	0	0	4	2
11	ES	Innovation and Entrepreneurship	0	0	2	1
12	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			13	**1**	**18**	**22**

- **IoT and Embedded Systems, Innovation and Entrepreneurship, Indian Knowledge System and Self Growth will be evaluated through activity-based assessments**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3**

Electronics & Communication Engineering (ECE)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Environmental Chemistry	2	0	0	2
3	ES	Programming For Problem Solving	3	0	0	3
4	PC	Computer Organization & Logic Design	3	0	0	3
5	ES	Design & Realization	2	0	0	2
6	PC	Intelligent Health Care Systems	1	0	0	1
7	ES	Design Thinking	1	0	0	1
Lab/Practical						
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	PC	Computer Organization & Logic Design Lab	0	0	2	1
10	ES	Design & Realization Lab	0	0	2	1
11	PC	Intelligent Health Care Systems Lab	0	0	2	1
12	HS	Communication Skills / Foreign Language	0	0	4	2
13	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
14	MC	Career Pathway*	0	0	2*	NC
15	MC	Ethics & Professional Competency*	0	0	2*	NC
16	MC	Electronics Workshop & PCB Design*	0	0	2*	NC
			15	**1**	**16**	**23**

- **Design Thinking, Self-Growth and Indian Knowledge System will be evaluated through activity-based assessments.**
- **Self Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Linear Algebra for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices	3	0	0	3
3	ES	Data Structure	3	0	0	3
4	ES	IoT and Embedded Systems	2	0	0	2
5	ES	Explorations in Electrical Engineering	2	0	0	2
Lab/Practical						
6	BS	Semiconductor Physics and Devices Lab	0	0	2	1
7	ES	Data Structures Lab	0	0	2	1
8	ES	IoT and Embedded Systems Lab	0	0	2	1
9	ES	Python for Engineers	0	0	4	2
10	HS	Foreign Language / Communication Skills	0	0	4	2
11	ES	Innovation and Entrepreneurship	0	0	2	1
12	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			13	**1**	**18**	**22**

- **IoT and Embedded Systems, Innovation and Entrepreneurship, Indian Knowledge System, and Self Growth will be evaluated through activity-based assessments**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3.**

Electrical and Electronics Engineering (EEE)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices	3	0	0	3
3	ES	Programming For Problem Solving	3	0	0	3
4	ES	Explorations in Electrical Engineering	2	0	0	2
5	ES	IoT and Embedded Systems	2	0	0	2
6	ES	Design Thinking	1	0	0	1
Lab/Practical						
7	BS	Semiconductor Physics and Devices Lab	0	0	2	1
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	ES	Explorations in Electrical Engineering Lab	0	0	2	1
10	ES	IoT and Embedded Systems Lab	0	0	2	1
11	HS	Communication Skills / Foreign Language	0	0	4	2
12	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
13	MC	Ethics & Professional Competency*	0	0	2*	NC
14	MC	Career Pathway*	0	0	2*	NC
			14	**1**	**16**	**22**

- **IoT and Embedded Systems, Design Thinking, Self-Growth and Indian Knowledge System will be evaluated through activity-based assessments.**
- **Self Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Linear Algebra for Engineers	3	1	0	4
2	BS	Environmental Chemistry	2	0	0	2
3	ES	Data Structure	3	0	0	3
4	ES	Design & Realization	2	0	0	2
5	PC	Emerging Technologies for Engineers	2	0	0	2
6	PC	Digital Logic Design	2	0	0	2
Lab/Practical						
7	ES	Data Structures Lab	0	0	2	1
8	PC	Emerging Technologies for Engineers Lab	0	0	2	1
9	ES	Design & Realization Lab	0	0	2	1
10	ES	Python for Engineers	0	0	4	2
11	HS	Foreign Language / Communication Skills	0	0	4	2
12	ES	Innovation and Entrepreneurship	0	0	2	1
13	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			14	**1**	**18**	**23**

- **Innovation and Entrepreneurship, Indian Knowledge System and Self Growth will be evaluated through activity-based assessments.**
- **Self Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3**

Electrical and Computer Engineering (ELCE)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices	3	0	0	3
3	ES	Programming For Problem Solving	3	0	0	3
4	ES	IoT and Embedded Systems	2	0	0	2
5	ES	Explorations in Electrical Engineering	2	0	0	2
6	ES	Design Thinking	1	0	0	1
Lab/Practical						
7	BS	Semiconductor Physics and Devices Lab	0	0	2	1
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	ES	IoT and Embedded Systems Lab	0	0	2	1
10	ES	Explorations in Electrical Engineering Lab	0	0	2	1
11	HS	Communication Skills / Foreign Language	0	0	4	2
12	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
13	MC	Ethics & Professional Competency*	0	0	2*	NC
14	MC	Career Pathway*	0	0	2*	NC
			14	**1**	**16**	**22**

- **IoT and Embedded Systems, Design Thinking, Self-Growth and Indian Knowledge System will be evaluated through activity-based assessments.**
- **Self Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Linear Algebra for Engineers	3	1	0	4
2	BS	Environmental Chemistry	2	0	0	2
3	ES	Data Structure	3	0	0	3
4	PC	Computer Organization and Logic Design	3	0	0	3
5	ES	Design & Realization	2	0	0	2
Lab/Practical						
6	ES	Data Structures Lab	0	0	2	1
7	PC	Computer Organization and Logic Design Lab	0	0	2	1
8	ES	Design & Realization Lab	0	0	2	1
9	ES	Python for Engineers	0	0	4	2
10	HS	Foreign Language / Communication Skills	0	0	4	2
11	ES	Innovation and Entrepreneurship	0	0	2	1
12	PC	Electrical Engineering Workshop	0	0	2	1
13	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			13	**1**	**20**	**23**

- **Innovation and Entrepreneurship, Indian Knowledge System and Self Growth will be evaluated through activity-based assessments.**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3**

Mechanical Engineering (ME)

1st Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Calculus for Engineers	3	1	0	4
2	BS	Semiconductor Physics and Devices	3	0	0	3
3	ES	Programming For Problem Solving	3	0	0	3
4	ES	Explorations in Electrical Engineering	2	0	0	2
5	ES	IoT and Embedded Systems	2	0	0	2
6	ES	Design Thinking	1	0	0	1
Lab/Practical						
7	BS	Semiconductor Physics and Devices Lab	0	0	2	1
8	ES	Programming For Problem Solving Lab	0	0	4	2
9	ES	Explorations in Electrical Engineering Lab	0	0	2	1
10	ES	IoT and Embedded Systems Lab	0	0	2	1
11	HS	Communication Skills / Foreign Language	0	0	4	2
12	MC	Self-Growth/ Indian Knowledge System	0	0	2	NC
Induction						
13	MC	Career Pathway*	0	0	2*	NC
14	MC	Ethics & Professional Competency*	0	0	2*	NC
			14	**1**	**16**	**22**

- **IoT and Embedded Systems, Design Thinking, Self-Growth and Indian Knowledge System will be evaluated through activity-based assessments.**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**

2nd Semester

S No.	Course Type	Subject Name	Academic Learning (AL)			Credits
			L	T	P	
1	BS	Differential Equations & Complex Integration	3	1	0	4
2	BS	Environmental Chemistry	2	0	0	2
3	ES	Data Structure	3	0	0	3
4	ES	Design & Realization	2	0	0	2
5	PC	Emerging Technologies for Engineers	2	0	0	2
6	PC	Engineering Mechanics	2	0	0	2
Lab/Practical						
7	ES	Data Structures Lab	0	0	2	1
8	ES	Design & Realization Lab	0	0	2	1
9	PC	Emerging Technologies for Engineers Lab	0	0	2	1
10	ES	Innovation and Entrepreneurship	0	0	2	1
11	ES	Python for Engineers	0	0	4	2
12	HS	Foreign Language / Communication Skills	0	0	4	2
13	MC	Indian Knowledge System/Self Growth	0	0	2	NC
			14	**1**	**18**	**23**

- **Innovation and Entrepreneurship, Indian Knowledge System and Self Growth will be evaluated through activity-based assessments.**
- **Self-Growth: Yoga Activities/ NSS/NCC/Sports etc.**
- **Indian Knowledge System: Indian Aesthetics (including Music and Music Instruments)/ Strategic Lessons from Bhagavad Gita/Leadership from Ramayana/Ayurved/Astronomy/ Astrology/Indian Vision for Human Society (Vishva Kalyan thru Vasudhaiva Kutumbkam)/Sanskrit/ Vedic Math/ Classical Dance etc.**
- **Summer Internship (4-week) on Social Problems during summer break after Semester-2 and same will be assessed/evaluated in the Semester-3**

Theory Courses Detail Syllabus

Theory Course Code: K24AS11	**Theory Course Name: Calculus for Engineers**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**3**	**1**	**0**	**4**

Pre-requisite: NA

Course Objectives:

1. The objective of this course is to familiarize the graduate engineers with techniques of multivariate analysis of real, complex and vector functions in calculus.
2. It aims to impart the knowledge of tools from intermediate to advanced level that will enable them to handle complex problems and its applications so that they would find useful in their disciplines.

Course Outcome: After completion of the course, the student will be able to

1. Apply the concept of partial differentiation in application of homogeneous and composite functions.
2. Apply knowledge of partial differentiation in extrema, series expansion of functions and Jacobians.
3. Construct the transformations using the concept of analyticity and harmonicity of complex functions.
4. Employ the concept of multiple integration to find the area of bounded region.
5. Apply the concept of vector differentials to study the properties of point functions.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	-	1	-	-	-	2
CO2	2	2	2	-	-	-	-	1	-	-	-	2
CO3	3	2	2	-	-	-	-	1	-	-	-	1
CO4	3	2	2	-	-	-	-	1	-	-	-	1
CO5	3	2	2	-	-	-	-	1	-	-	-	1

Unit 1	**Differential Calculus I**	**09 hours**

Introduction of Limits, continuity and differentiability for function of two variables, Higher order Partial derivatives, Euler's Theorem for homogeneous functions, Total derivative of composite functions.

Unit 2	**Differential Calculus II**	**09 hours**

Taylor's and Maclaurin expansion for function of two variables, Jacobians, properties of Jacobian (without proof) Hessian Matrix, Maxima & minima for function of two variables.

Unit 3	**Complex Variable – Differentiation**	**09 hours**

Functions of complex variable, Limit, Continuity and differentiability, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Conformal mapping, Mobius transformation.

Unit 4	**Multiple Integral**	**09 hours**

Evaluation of double integrals, change of order of integration, Change of variable (double -integral). Application of double integrals to find the area of a region.

Unit 5	**Vector differentiation**	**09 hours**

Scalar point function, Vector point function, Gradient of a scalar field, Directional derivatives, Application of divergence, curl to solenoidal and irrotational vectors respectively.

	Total Lecture Hours	**45 hours**

Textbook:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd., 2017
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2020.
3. R K. Jain & S R K. Iyenger, Advanced Engineering Mathematics, Narosa Publishing House 2017.

Reference Books:

1. Dan Hamilton, Calculus 1 - Differentiation and Integration, Hamilton Education Guides 2018.
2. Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus, Pearson, 2002.
3. Peter V. O'Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning, 2007.
4. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2015.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1	MSE2	CA1	CA2	CA3	CA4 (ATT)	CA5		
40	40	5	5	5	5	5		
80		Best of 4 (20)					100	200

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24AS12/K24AS22	**Theory Course Name: Semiconductor Physics and Devices**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**3**	**0**	**0**	**3**

Pre-requisite: NA

Course Objectives:

To impart the technical aspect of semiconductor Physics and devices to engineering graduates so that they are able to assess and contribute to the solution of technical and engineering problems that are based on broad principles of Physics including solid state physics, semiconductors, optoelectronics devices and Quantum Physics.

Course Outcome: After completion of the course, the student will be able to

1. Illustrate the basic concept of crystalline materials and their appropriate use.
2. Apply the fundamentals of basic semiconductor Physics on transistor and MOSFET.
3. Apply the concepts of semiconductor Physics in aspect of solar cell and Zener diode.
4. Implementing of semiconductor Physics to study various characteristics of optoelectronic devices.
5. Apply the concept of Quantum Physics to study various phenomenon.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	2	-	-	2	-	3
CO2	3	2	-	-	-	2	2	-	-	2	-	3
CO3	3	2	-	-	-	2	2	-	-	2	-	3
CO4	3	2	-	-	-	2	2	-	-	2	-	3
CO5	2	1	-	-	-	-	-	-	-	1	-	2

Unit 1	**Crystal Structures**	**09 hours**

Distinction between crystalline, Polycrystalline, and Amorphous materials, Space lattice, basis, Unit cell, Lattice parameter, seven crystal systems and Fourteen Bravais lattices, Diamond crystal structure, Packing factor (cubic, body and face), Lattice planes and Miller Indices, Bragg's law.

Unit 2	**Semiconductors**	**11 hours**

Band Theory of Solids, Fermi-Dirac distribution, Free carrier density (electrons and holes), Conductivity of semiconductors, Fermi level in intrinsic and extrinsic semiconductors, Bipolar junction transistor, p-n-p and n-p-n transistors, Introduction of FET and MOSFET, I-V characteristics, Capacitance, CMOS circuits.

Unit 3	**Semiconducting Devices**	**09 hours**

Solar Cell: Photovoltaic effect, Construction and working of solar cell, I-V characteristics of solar cell, Conversion efficiency, Fill factor, Applications of solar cells. Photodetectors: Principle of photodetector, Construction and working of photodiode and PIN diode, Applications of photodetectors.

Unit 4	**Optoelectronic Devices**	**08 hours**

Light Emitting Diode (LED): Direct and indirect band gap semiconductors, Electron-hole pair generation and recombination, non-radiative and radiative recombination in semiconductors, Differences between homo and hetero junction LEDs, Construction and working of homo junction LED, Characteristics, quantum efficiency, advantages, and applications of LED.

Unit 5	**Quantum Mechanics**	**08 hours**

Inadequacy of classical mechanics, Planck's theory of black body radiation (qualitative), de-Broglie concept of matter waves, Heisenberg's uncertainty principle, Phase velocity and group velocity, Time-dependent and time-independent Schrodinger wave equations, Physical interpretation of wave function, Particle in a one- Dimensional box.

	Total Lecture Hours	**45 hours**

Textbook:

1. Donald A. Neamen, Semiconductor Physics and Devices, 4th Edition, Mc Graw Hill Education, 2012.
2. S.M. Sze, Semiconductor Physics and Devices, 3rd Edition, Wiley, 2021
3. S.O. Pillai, Solid State Physics, 10th Edition, New Age International Publishers, 2022

Reference Books:

1. V.K. Mehta, Principle of Electronics, 12th Edition, S. Chand, 2020
2. Ben G. Streetman, Solid State Electronic Devices, 7th Edition, Pearson, 2015.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1	MSE2	CA1	CA2	CA3	CA4 (ATT)	CA5		
30	30	4	4	4	3	4		
60		Best of 4 (15)					75	150

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24AS13/K24AS23	**Theory Course Name: Environmental Chemistry**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

The objective of this course is to impart the technical aspect of Chemistry and Environment Sciences to engineering graduates so that they are able to assess and contribute to the solution of technical and engineering problems that are based on broad principles of Chemistry and Environment Sciences.

Course Outcome: After completion of the course, the student will be able to

1. Apply the knowledge of advanced materials for interdisciplinary applications.
2. Employ the concept of electrochemistry for portable energy devices to provide viable solutions for industrial problems.
3. Apply the insight of environment and resources for sustainable development.
4. Determine the environment related issues, their impacts and provide the sustainable solutions.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	-	1	1	-	-	-	-	1
CO2	2	2	1	2	-	1	1	-	-	-	-	1
CO3	2	2	1	1	-	2	2	-	-	-	-	2
CO4	2	2	1	1	-	2	2	-	-	-	-	2

Unit 1	**Advanced Materials for Smart Devices**	**07 hours**

Chemical bonding, Advanced Materials structure, properties and their applications: Chromo active materials (Liquid crystals), Nanomaterials, Polymeric Materials-PANI and PEDOT in sensors, PMMA in smart devices, Sustainable polymers (PLA, PGA, PHBV), Leaching of Micro-plastics.

Unit 2	**Eco-friendly Portable Energy Convertible Devices**	**08 hours**

Introduction to Electrochemistry, Galvanic Cell, Green Batteries and their applications. **Photovoltaic cell:** Production of solar grade silicon and its properties, doping of silicon, Dye sensitized solar cells. **Green Fuel cell:** Methanol-Oxygen fuel cell, Hydrogen-based fuel cell to decarbonize the global energy, storage and its applications.

Unit 3	**Environmental Systems: The Chemistry of Air, Soil, and Water**	**08 hours**

Environmental segments: Composition and segments of Atmosphere. **Air pollution**: Introduction, major sources of air pollution, air pollutants, Effect of pollutants on humans, materials and vegetation. **Greenhouse effect and global warming**: El Nino and La Nina phenomenon. **Ozone layer:** Creation, mechanism of depletion and its effect. Smog: Sulphurous and photochemical smog, formation mechanism, and its control. **Water pollution:** Properties of water, water Pollution Sources, water treatment and purification technologies **Soil pollution:** Origin and nature of soil, sources of soil pollution. soil pollution and plant growth, soil remediation techniques.

Unit 4	**Environmental Toxicology & Waste management**	**07 hours**

Toxicants: Types and sources of environmental toxicants, physiological response to toxicants (Mutagenesis, Carcinogenesis, Teratogenesis), Case Studies of Toxic Events and Responses. **Waste management:** Types of waste (e.g., municipal solid waste, hazardous waste, industrial waste, e-waste, biomedical waste), Waste Management Strategies (e.g., recycling, treatment, disposal), Remediation Technologies (bioremediation), Environmental Policies and Regulations. **Sustainable Development:** Concepts and definition,17 SDGs with a focus on relevant goals, SDG Goals by 2030 (Principles, challenges, global initiative and policies).

Total Lecture Hours	**30 hours**

Textbook:

1. Rajaram J., Kuriacose J. C.,"Chemistry in Engineering and Technology", Vol.1, Tata McGraw-Hill, India, 2018.
2. Fahlman B. D., "Materials Chemistry", Germany, Springer Netherlands, 2018.
3. Deswal S., "Environmental Studies" Dhanpat Rai & Co., 2012.

Reference Books:

1. Hwang N.M., "Non-Classical Crystallization of Thin Films and Nanostructures in CVD and PVD Processes" Springer, Netherland, 2016.
2. Billmayer F.W., "Textbook of Polymer Science", 3rd Ed. Wiley, 2007.
3. Rajgopalan R. "Environmental Studies" Ed. III, Oxford University Press, 2016.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 20	MSE2 20	CA1 2	CA2 2	CA3 3	CA4 (ATT) 3	CA5 3		
40		Best of 4 (15)					50	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24IT11	**Theory Course Name: Programming for Problem Solving**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**3**	**0**	**0**	**3**

Pre-requisite: Computer block diagram, Generation of programming languages, Translators, Flowchart

Course Objectives:

1. Given a computational problem, identify and abstract the programming task involved.
2. Approach the programming tasks using techniques learned and writepseudo-code.
3. Choosethe right data representation formats based on the requirements of the problem.
4. Use comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
5. By learning the basic programming constructs, students can easily switch over to any other language in future.

Course Outcome: After completion of the course, the student will be able to

1. Apply programming constructs of C language to solve real-world problems.
2. Use the concepts of looping, branching, and decision-making statements for a given problem.
3. Develop Solutions to problems using modular programming constructs such as functions and recursion.
4. Demonstrate the ability to write C programs using pointers, strings structures and unions.
5. Design a solution to problems using the concepts of pointers and files handling.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	1	-	-	-	2	-	2
CO2	3	3	-	2	2	-	-	1	-	-	-	2	-	2
CO3	3	3	-	2	2	-	-	1	-	-	-	2	-	2
CO4	3	3	2	2	2	-	-	1	-	-	-	2	-	2
CO5	3	3	2	2	2	-	-	1	-	-	-	2	-	2

Unit 1	**Introduction**	**09 hours**

Introduction: Algorithm, Structure of C program, Writing the first C program, Compilation and execution process. Tokens: Keywords, Identifier, Variables, Constants, Strings, Character set.

Operators: Arithmetic, Relational, Equality, logical, Unary, Conditional, Bitwise, Comma, Operator precedence and associativity, type conversion, and type casting.

Best Practices in Code writing: Naming Conventions and Importance of Comments to enhance the readability of the program.

Unit 2	**Decision Control and Looping Statements**	**09 hours**

Decision Statements: Conditional Branching statements: if, if-else, if-else-if, switch case.
Iterative statements: while, do-while, for loop and Nested loops, Break and continue statements.

Unit 3	**Functions & Recursion**	**09 hours**

Functions & Recursion: Need for function, function declaration /Function prototype, Function Definition, Function calling. Passing parameter to the Function: Call by value and call by reference Scope: Block scope, function scope. **Storage Classes:** Auto, register, Extern, static, Recursion.

Unit 4	**Arrays, Strings &Structures**	**09 hours**

Arrays, Strings &Structures: Fundamental of Array: One dimension Array, Declaration, Initialization. Operations on Array: Insertion, deletion, Traversing. Passing 1D array to functions, 2-D array and its operations
Pointers: Pointer: Introduction, Pointer declaration, and Pointer Arithmetic, Pointer and Arrays, Pointer to Pointer, Arrays of Pointers.
Applications of pointer: Dynamic memory allocation.

Unit 5	**String and File Handling**	**09 hours**

String handling: Reading, writing strings, String functions: strlen( ), strcpy( ),strcat( ),strrev (), strcmp( ), and their implementation as user-defined**. Structure & Union:** Introduction of Structures: Structure declaration, Initialization, Accessing the member of structure. Nested structure and Array of structure. Passing individual members, Passing the entire structure. Introduction to Union.
File Handling: Introduction to file Handling.

	Total Lecture Hours	**45 hours**

Textbook:

1. Herbert Schildt. "TheCompleteReferenceC",4th Edition, TMH,2017
2. Brian W. Kernighanand Dennis M. Ritchie, "The C programming language",2nd Edition, Pearson Education India,2015
3. Let Us C: Authentic guide to C programming language - Nineteenth edition (December 2022); BPB Publications, Ansari Road, Dariya Ganj
4. E. Bala Guruswamy, Programming in ANSI C", Eighth edition, TMH,2019
5. Ashok N. Kamthane and Amit A Kamthane "Programming in C", 3rd Edition, Pearson Education,2015

Reference Books:

1. B. A. Forouzan, R. F. Gilberg, B.G. Geetha, and G. Singaravel, "Computer Science: A structured Programming Approach Using C", 3rd Edition, Cengage, New Delhi,2012
2. H. Cooperand H. Mullish, "TheSpiritofC",4th Edition, JaicoPublishingHouse,2006
3. Paul Deitel, Harvey Deitel, "C How to Program", 8th Edition (February 2015), Pearson.

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
30	**30**	**4**	**4**	**4**	**3**	**4**		
60		**Best of 4 (15)**					**75**	**150**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24AS14/K24AS24	**Theory Course Name: Discrete Structures & Theory of Logic**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)		**3**	**0**	**0**	**3**

Pre-requisite: NA

Course Objectives:

1. The objective of this course is to familiarize the graduate students with the fundamentals of discrete structure and theory of logics.
2. It aims to apply the theory of inferences and graphs in solving the advanced technological problems.

Course Outcome: After completion of the course, the student will be able to

1. Acquire knowledge of sets, relations, Poset and lattices to solve ordered structures and their relationship problems
2. Apply fundamental concepts of functions and Boolean algebra in logical reasoning and computational abilities.
3. Employ the rules of propositions, theory of inferences and predicate logic in logical reasoning problems.
4. Understand the concepts of algebraic structures and their applications to apply in critical thinking
5. Apply the concept of graph theory in solving shortest path engineering problems**.**

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	-	1	-	-	-	1
CO2	2	1	1	-	-	-	-	1	-	-	-	1
CO3	2	1	1	1	-	-	-	1	-	-	-	1
CO4	2	2	1	-	-	-	-	1	-	-	-	1
CO5	2	2	2	-	-	-	-	1	-	-	-	2

Unit 1	**Sets, Relations, Poset & Lattices**	**09 hours**

Set Theory& Relations: Introduction, Combination of sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. **POSET & Lattices:** Hasse Diagram, POSET, Definition & Properties of lattices – Bounded, Complemented, Distributed, Modular and Complete lattice. **Application of Sets and Posets:** Discuss the allocation or segregation problems using Set theory Discuss set of tasks in a project management using Posets and Hasse diagram.

Unit 2	**Functions & Boolean Algebra**	**09 hours**

Functions: Definition, Classification of functions, Operations on functions. Growth of Functions. **Boolean Algebra:** Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps. **Application of Boolean Algebra:** Discuss one or two case studies of application of Boolean algebra in digital circuit design.

Unit 3	**Theory of Logics**	**09 hours**

Theory of Logics: Proposition, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well- formed formula of predicate, quantifiers, Inference theory of predicate logic. **Applications of Predicate Logics:** Discuss the case studies like Family- Tree, Water-Jug, Monkey-Banana problems, etc.

Unit 4	**Algebraic Structures**	**09 hours**

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.
Applications of Group Theory: Coordination of Robot Arms in a Factory, Allocating Resources for a Community Garden.

Unit 5	**Graph Theory**	**09 hours**

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. **Applications of Graphs:** Discuss one or two case studies like Finding shortest path: travelling sales man problem, Chinese postman problem

	Total Lecture Hours	**45 hours**

Textbook:

1. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", Tata McGraw Hill. 1997 2nd edition Reprint 2017
2. Swapan Kumar Sarkar, A Textbook of Discrete Mathematics, S Chand Publishing.

Reference Books:

1. C. L. Liu, Elements of Discrete Mathematics: A Computer Oriented Approach, McGraw Hill. 4th edition (Paperback 2017)
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, PhI Learning
3. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 3rd edition
4. Thomas Koshy, Discrete Mathematics with Application, Elsevier Pub. 2004
5. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill
6. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill, 3rd edition (Paperback 2017)
7. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, Prentice Hall, 3rd edition

Mode of Evaluation

MSE		CA					ESE	Total
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
30	**30**	**4**	**4**	**4**	**3**	**4**		
60		**Best of 4 (15)**					**75**	**150**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EC11/K24EC21	**Theory Course Name: Computer Organization & Logic Design**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/ELCE		**3**	**0**	**0**	**3**

Pre-requisite: NA

Course Objectives:

1. Explore the basics of digital logic, including number systems and logic gates.
2. Perform the analysis and design of various digital electronic circuits.
3. Explore the knowledge of Computer organization and memory concepts.
4. Work in a team to demonstrate an application of digital circuits by engaging in self-learning.

Course Outcome: After completion of the course, the student will be able to

1. Apply the basics of binary arithmetic and codes in digital system design.
2. Design combinational logic circuits using Boolean functions and gate-level minimization
3. Design sequential logic circuits, including latches, flip-flops, registers, and counters.
4. Understand computer organization, including bus architecture, processor organization, and I/O systems.
5. Understand memory organization, cache, and virtual memory.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	-	-	-	-
CO2	3	3	2	2	1	1	-	-	-	-	-	-	2	-
CO3	3	3	2	2	1	1	-	-	-	-	-	-	2	-
CO4	3	3	2	2	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	1	1	-	-	-	-	-	-	2	-

Unit 1	**Digital Design and Binary Numbers**	**09 hours**

Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes. Multiplication: Signed operand multiplication, Booth's algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, IEEE Standard for Floating Point Numbers

Unit 2	**Combinational Logic Circuits**	**09 hours**

Minterm and Maxterm, Boolean Algebra, Realization of Boolean Functions, SOP and POS simplification, Gate-level minimization: The K-map method up to four variables, don't care conditions, Quin-McClusky Method. NAND and NOR implementation. Binary Adder-Subtractor, Look ahead carries adders Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Arithmetic & logic unit design.

Unit 3	**Sequential Logic Circuits**	**10 hours**

Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure. Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.

Unit 4	**Basics Of Computer Organization And Input/Output**	**09 hours**

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes. Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors.

Unit 5	**Memory**	**08 hours**

Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement, Virtual memory: concept implementation

	Total Lecture Hours	**45 hours**

Textbook:

1. Anand Kumar, Fundamentals of Digital Circuits", PHI, 4th, 2016.
2. M Morris Mano, Digital Logic and Computer Design", Pearson, 6th, 2020.
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Tata McGraw Hill, 6th, 2012.

Reference Books:

1. M Morris Mano, "Digital Design: With an Introduction to the Verilog HDL and System Verilog", Pearson, 6th, 2018.
2. Charles H Roth and Larry L Kinney, "Analog and Digital Electronics", Cengage Learning, 2019.
3. Volnei A. Pedroni, "Circuit Design with VHDL", MIT Press, 3rd, 2020.
4. Brown S. and Zvonko Vranesic, "Fundamental of Logic with Verilog Design", Tata McGraw Hill, 1st, 2003.

5. William Stallings, "Computer Organization and Architecture", Pearson, 11th, 2018.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 30	MSE2 30	CA1 4	CA2 4	CA3 4	CA4 (ATT) 3	CA5 4		
60		Best of 4 (15)					75	150

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EEE11/K24EEE21	**Theory Course Name: IoT and Embedded Systems**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

1. The course aims to provide exposure to the applications of IoT in smart cities and industrial applications.
2. It aims to train the students to the basic concepts of the Embedded C.
3. It aims to train the students to the basic concepts of the Controller.
4. This course is designed to give the students hands-on experience with the Software and Hardware concepts.

Course Outcome: After completion of the course, the student will be able to

1. Understand the basic concepts of sensors and transducers.
2. Understand basics of embedded system and different IoT boards.
3. Apply basic operations and programming techniques of IoT devices.
4. Apply smart technology knowledge through case studies.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	2	2	-	-	-	-	2	-	2
CO2	2	-	2	-	2	2	2	-	2	-	-	2	-	2
CO3	3	-	3	2	3	2	2	-	2	-	-	2	-	3
CO4	3	2	3	3	3	2	2	-	2	-	-	2	-	3

Unit 1	**Sensing Devices & Transducers**	**08 hours**

Sensors & Transducer: Definition, Types & selection criterion of sensors, Classification of Sensors & Transducer based on principle of operation, Fundamentals & Applications of Potentiometer, Fundamentals & Applications of strain gauge.

Unit 2	**Embedded Systems Fundamentals**	**06 hours**

Introduction to Embedded C: Interfacing Basics, Digital I/O, Analog I/O, Differences between standard C and Embedded C, Introduction to Arduino (ATmega328P), Arduino board components and architecture, Introduction to Raspberry Pi 5, Understanding GPIO pins and their modes, Interfacing DHT11 with Arduino.

Unit 3	**IoT Board**	**08 hours**

Introduction to IoT in Modern Industry Applications, Basic Operations of IoT, Basics of ESP 8266 programming, Introduction to Blynk IoT, Interfacing with Different types of Sensors: Touch Sensor, Alcohol Sensor (MQ 3), LPG Sensor (MQ 6), Relay, Light Dependent Resistor (LDR), IR (Infrared) Sensors and PIR (Passive Infrared) Sensors.

Unit 4	**Smart Sensor Technologies**	**08 hours**

Intelligent Sensors: General Structure of smart sensors & its components, Case study of Air Quality Monitoring System, Case study of Soil Health Monitoring System, Case study of Water Quality Monitoring System.

	Total Lecture Hours	**30 hours**

Textbook:

1. Raj Kamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Education (India) Private Limited CHENNAI.
2. Waldemar Nawrocki , "Measurement Systems and Sensors" , Artech House Boston , London.
3. K. Krishnaswamy and S. Vijayachitra ,"Industrial Instrumentation", New Age International Publishers.
4. D. Patranabis, "Sensors and Transducers" , PHI Learning Pvt. Ltd. Delhi.

Reference Books:

1. Murty D.V.S, "TRANSDUCERS AND INSTRUMENTATION", 2ND EDN, PHI.
2. Rajkumar Buyya and Amir Vahid Dastjerdi , "Internet of Things: Key Applications and Protocols" Elsevier.
3. "Internet of Things: A Hands - on approach" by Arsheep Bahga and Vijay Madisetti., Orient Blackswan Private Limited - New Delhi 2.
4. Pethuru Raj and Anupama C. Raman. "The Internet of Things: Enabling technologies, platforms, and use cases". Auerbach Publications.
5. "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and Beagle Bone Black" by Donald Norris, McGraw-Hill Education TAB.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 20	MSE2 20	CA1 2	CA2 2	CA3 3	CA4 (ATT) 3	CA5 3		
40		Best of 4 (10)					50	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24ME11/K24ME21	**Theory Course Name: Design & Realization**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/ECE/EEE/ELCE/ME		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

1. To familiarize students with the modern technologies used in industries.
2. To realize the fundamentals of Computer Aided Design & digital manufacturing.

Course Outcome: After completion of the course, the student will be able to

1. Create 2D and 3D models using Computer Aided Design software.
2. Apply 3D modelling techniques and STL file preparation for additive manufacturing.
3. Create a model using 3D printer.
4. Develop engineering components using CNC/VMC machine.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

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

Unit 1	**Computer-aided Design**	**12 hours**

First and third angle projection. Orthographic Projection: projection of point, Projection of solids, Principles of isometric projection isometric scale –Isometric projections of simple solid with AutoCAD 3D interface. Morphology of Design, mapping of design phase with CAD functions, product cycle computer-aided design.

Unit 2	**CAD for 3D Printing**	**06 hours**

CAD Modelling for 3D printing: Introduction to 3D printing, 3D Scanning, and digitization, AM Software: data formats, Creating STL file, Advantages and limitations of STL file format; slicing: -uniform flat layer slicing, adaptive slicing, Process-path generation: rasterization, part Orientation, and support generation.

Unit 3	**3D Printing**	**06 hours**

Liquid-based 3D Printing: Photo Polymerization - Principle and working of stereolithography apparatus (SLA) based 3D printing process; Applications; Post Processing, Solid ground curing (SGC). Solid state 3D Printing: Basic Principle and working of Fused deposition modelling (FDM) process and laminated object manufacturing (LOM) process; Post Processing, Applications. Powder-based 3D printing: Principle and working of Selective Laser Sintering (SLS) process; Applications; Post Processing.

Unit 4	**Computer Aided Manufacturing**	**06 hours**

Introduction to CNC Machining, Advantages and limitations of CNC machining, Types of CNC machines, Components of a CNC machine (e.g. controller, spindle, axes, ATC), CNC machine configurations (e.g., 3-axis, 5-axis). CNC Programming Basics: Introduction to G-code and M-code programming & its basic applications.

Total Lecture Hours	**30 hours**

Textbook:

1. Engineering Graphics & Design, P. S. Gill.
2. Computer-Aided Graphics and Design, Daniel L. Ryan
3. Computer-Aided Design and Manufacturing by M. Groover

Reference Books:

1. Engineering Graphics With AUTOCAD, Kulkarni D.M
2. An Introduction to 3D Printing by Victoria Zukas and Jonas A. Zukas
3. Computer Aided Manufacturing, P.N. Rao, N.K. Tewari, T.K. Kundra

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 20	MSE2 20	CA1 2	CA2 2	CA3 3	CA4 (ATT) 3	CA5 3		
40		Best of 4 (10)					50	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24AI11/K24AI21	**Theory Course Name: Introduction to AI**	**L**	**T**	**P**	**C**
Course Offered in: CSE(AI)/CSE(AIML)		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

The objective of this course is to provide students with a solid understanding of AI principles and applications, gain insights into robotics, computer vision and natural language processing, explore ethical considerations, and acquire hands-on skills in implementing AI solutions for real-world scenarios.

Course Outcome: After completion of the course, the student will be able to

1. To understand the fundamental concepts, theories, and techniques in artificial intelligence (AI), and attain proficiency in implementing and utilizing search algorithms, heuristics, and game playing strategies.
2. To understand different methods of knowledge representation and learning to apply these techniques to capture and utilize domain-specific knowledge in AI systems.
3. Develop insights into the challenges and techniques associated with applying AI of Natural Language Processing (NLP), Computer Vision, and Robotics.
4. Acquire knowledge of the ethical considerations related to AI, encompassing fairness, transparency, and accountability and analyze the societal impacts of AI technologies to develop a comprehensive understanding of responsible AI practices and futuristic domains.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3			2	2		3	3	2	2
CO2	3	3	3	3	3			2	2		3	3	2	2
CO3	3	3	3	3	3			2	2		3	3	2	2
CO4	3	3	3	3	3			2	2		3	3	2	2

Unit 1	**Introduction to AI**	**08 hours**

Discussion on Course outcomes and Introduction to AI, Motivation and role of Artificial Intelligence, AI from Turing Test to Humanoids , Various approaches to AI, AI concept , terminology and application area, Agents and Environments, Types of AI: Search Based System, Rule Based system, Learning Based System, Adversarial search and Games: Optimal Decisions in games, min-max algorithm, alpha-beta pruning, Constraint satisfaction problem: Constraint Propagation, Backtracking search, local search.

Unit 2	**Understanding Data**	**06 hours**

History Of Data, Data Storage And Importance of Data and its Acquisition, The Stages of data processing, Data visualization

Unit 3	**Domains of AI**	**08 hours**

Overview of ML: Supervised Learning, Unsupervised Learning, Overview of NLP : Speech recognition , Natural language understanding, Natural language generation, Machine Translation , Overview of Computer vision: image formation, image classification, image detection, Overview of ANN

Unit 4	**Uncertainty In AI And its Emerging Technologies**	**06 hours**

Uncertainty in AI: conditional independence, Baye's rule, naive baye's model, Simple decision: utility function, decision network, Reinforcement learning: Active learning, Passive learning, Model Based Learning. Emerging Technologies: Generative Adversarial Networks, Chatbot, Generative AI: Overview-ChatGPT, Ethics of AI, future of AI.

	Total Lecture Hours	**30 hours**

Textbook:

1. NORVIG, P. R. (2021). Artificial intelligence: A modern approach, 4th edition, Pearson

Reference Books:

1. Rajendra Aketkar, "Introduction to Artificial Intelligence" (E-book)

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
20	**20**	**2**	**2**	**3**	**3**	**3**		
40		**Best of 4 (10)**					**50**	**100**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EC13	**Theory Course Name: Intelligent Health Care System**	**L**	**T**	**P**	**C**
Course Offered in: ECE		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

1. Explore Fundamentals of Health Care and the Role of Intelligent Systems in Health Care System.
2. Realize Health Care Technologies with Emerging Trends and Innovations

Course Outcome: After completion of the course, the student will be able to

1. Apply the Fundamentals of Health Care Systems.
2. Explore the Role of Intelligent Systems in Health Care.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	1	1	-	1	-	-	-	1		3
CO2	3	3	2	2	1	1	-	1	-	-	-	1		3

Unit 1	**Introduction to Intelligent Health Care Systems**	**10 hours**

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone -Biomechanics of soft tissues - Basic mechanics of spinal column and limbs -Physiological signals and transducers -Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fiber optic temperature sensors.

Unit 2	**Biomedical Devices and Future Trends**	**05 hours**

Biomedical Devices and Future Trends: Demonstration and working mechanism of Biomedical device: Patient Monitor while covering essential physiology parameters such as ECG, BP, Heart Rate etc. Future Trends and Innovations: Emerging technologies in intelligent healthcare systems, Research directions and future possibilities.

	Total Lecture Hours	**15 hours**

Textbook:

1. Leslie Cromwell, Biomedical Instrumentation and Measurement, Prentice Hall of India, New Delhi,2007.
2. M. Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
3. Khandpur R.S, Handbook of Biomedical Instrumentation, , Tata McGraw-Hill, New Delhi, 2 Edition, 2003.

Reference Books:

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, NewYork, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. Joseph J.carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th Edition, 2012.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 20	MSE2 20	CA1 2	CA2 2	CA3 3	CA4 (ATT) 3	CA5 3		
40		Best of 4 (10)					-	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EEE13	Theory Course Name: Explorations in Electrical Engineering	L	T	P	C
Course Offered in: ECE/EEE/ELCE/ME		2	0	0	2

Pre-requisite: NA

Course Objectives:

1. Implement different circuits and verify circuit concepts for DC and AC circuits.
2. Prove the various theorems used to reduce the complexity of electrical network.
3. The operation and characteristics of AC machines and DC machines.

Course Outcome: After completion of the course, the student will be able to

1. Understand the concepts of electric circuit solutions with DC supply using mesh-nodal analysis and Network Theorems.
2. Apply the concepts of electrical circuits with AC supply in single and three phase system
3. Analyze the equivalent circuit and performance of single-phase AC transformer
4. Illustrate the working principle of induction motors, synchronous machines and DC machines.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	3	-	-

Unit 1	DC Circuits	10 hours

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Superposition theorem and Thevenin's theorem.

Unit 2	AC Circuits	05 hours

Representation of Sinusoidal waveforms – Average and effective values, Form factor and peak factor, Concept of phasors, phasor representation of sinusoidal varying voltage and current. Analysis of single-phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power and Power factor. Introduction to 3-phase AC Circuits.

Unit 3	Magnetic Circuit and Transformer	07 hours

Magnetic circuits and calculation related to simple magnetic circuits, Working principle of Transformer, EMF equation of transformer, Ideal and practical transformer, losses in transformers, Efficiency of Transformer. Introduction to Auto Transformer.

Unit 4	Introduction to Electrical Machines	07 hours

Introduction to DC Machines, Types of DC Machines, Working principle of three phase Induction Motor and concept of slip, Toque-slip characteristics, Different starting methods of 1-phase induction motor. Working principle of Synchronous motor.

	Total Lecture Hours	30 hours

Textbook:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.

2. Hughes, E., Smith, I.M., Hiley, J. and Brown, K., "Electrical and Electronic Technology", PHI (2008)
3. P.V. Prasad, S. Sivanagaraju, "Electrical Engineering: Concepts and Applications" Cengage, 2018.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India, 2018.

Mode of Evaluation

MSE		CA					ESE	Total
MSE1 20	MSE2 20	CA1 2	CA2 2	CA3 3	CA4 (ATT) 3	CA5 3		
40		Best of 4 (10)					50	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24CSIT11	**Theory Course Name: Design Thinking**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**1**	**0**	**0**	**1**

Pre-requisite: NA

Course Objectives:

1. To expose the student with state of the art perspectives, ideas, concepts, and solutions related to the design and execution of projects using design thinking principles.
2. To prepare the mindset and discipline of systemic inspiration driven by a desire to identify new sources of ideas, and new models especially outside their regular working atmosphere.
3. To propose a concrete, feasible, viable and relevant innovation project/challenge.

Course Outcome: After completion of the course, the student will be able to

1. Understand the basic requirements of a good design.
2. Empathize and ideate the solutions to problems in his environment
3. Prototype and test the developed solutions.
4. Apply the principles of design thinking on developing innovative solutions to the real world problems.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

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

Unit 1	**Fundamentals Of Design Thinking**	**4 hours**

Concept of Design Thinking, Need of Design Thinking, Goal of Design thinking (Desirability, feasibility and viability), Design thinking Process model, Design thinking tools.

Activities: Identify an Opportunity, Scope of the Project, Explore the possibilities and prepare a design brief.

Unit 2	**Empathize And Define**	**04 hours**

Design thinking phases, how to empathize, Role of empathy in design thinking, the purpose of empathy maps, Things to be done prior to empathy mapping, Activities during and after the session, Understanding empathy tools: Customer Journey Map, Personas. Define-Methods of Define Phase: Storytelling.

Activities: Apply the methods of empathizing and Define Phases Finalize the problem statement.

Unit 3	**Ideation**	**04 hours**

Challenges in idea generation, Visualize, Empathize, and Ideate method, Importance of visualizing and empathizing before ideating, Applying the method, Create Thinking, Generating Design Ideas, Lateral Thinking, Analogies, Brainstorming, Mind mapping, Ideation Tools: How Might We? (HMW), Storyboard, Brainstorming. What is design innovation? A mindset for innovation, and asking, "What if?" asking "What wows?" and "What works?"

Activities: Apply the methods of Ideate Phase: Generate Innovative solution ideas.

Unit 4	**Prototyping And Testing**	**03 hours**

What is a prototype? - Prototyping as a mindset, prototype examples, prototyping for products; Why we prototype? Fidelity for prototypes, Process of prototyping- Minimum Viable prototype. Testing prototypes with users, Collect feedback; iterate and improve the ideas.

Activities:

1. Prototype: Apply the Methods of the Prototype Phase - Create prototypes for selected ideas.
2. Testing: Collect feedback; iterate and improve the ideas Present your solution using the Storytelling method.

Total Lecture Hours	**15 hours**

Textbook:

1. Design Thinking, A Beginner's Perspective, E Balaguruswamy, Bindu Vijayakumar, Mc Graw Hill,2024
2. The Design Thinking Playbook, Michael Lewrick (Author), Patrick Link (Author), Larry Leifer (Author) Publisher Wiley, Edition 2018.
3. Design Thinking For Dummies, Prof. Dr. Christian Müller- Roterberg, Wiley, 2021
4. The Design of Everyday Things, Don Norman(Author), Navol Books Trading, Edition 2022.

Reference Books:

1. Designing Experiences, James Robert Rossman and Mathew D. Duerden, Columbia Business School Pub, Edition 2019.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next CompetitiveAdvantage", Harvard Business Press, Edition 2009.
3. Idris Mootee, Design Thinking for Strategic Innovation,2013, John Wiley & Sons Inc.

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
20	**20**	**2**	**2**	**3**	**3**	**3**		
40		**Best of 4 (10)**					**-**	**50**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24AS21	**Theory Course Name: Linear Algebra for Engineers**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE		**3**	**1**	**0**	**4**

Pre-requisite: NA

Course Objectives:

1. The objective of this course is to develop a strong foundation in linear algebra and to impart the knowledge of tools from intermediate to advanced level of mathematics.
2. Students will be equipped with the necessary skills to apply linear algebra to solve complex engineering problems.
3. They will able to continue their studies in advanced topics within the field.

Course Outcome: After completion of the course, the student will be able to

1. Apply elementary transformation to solve system of Linear equations.
2. Employ the matrix factorization and decomposition.
3. Understand the concept of vector space and subspaces.
4. Explore the concept of linear transformations to apply in engineering applications.
5. 5.Explore the concept of inner products of vectors to decide orthogonality and orthonormality

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	-	-	-	-	1	-	-	-	2
CO2	2	2	3	-	-	-	-	1	-	-	-	1
CO3	2	2	2	-	-	-	-	1	-	-	-	1
CO4	2	2	2	-	-	-	-	1	-	-	-	1
CO5	2	2	2	-	-	-	-	1	-	-	-	1

Unit 1	**Matrix Algebra**	**09 hours**

Introduction to Real and Complex Matrices, Elementary Transformation, Rank of a Matrix by Echelon Form, Solution of system of Linear Equations by direct method (Gauss Elimination Method), Solution of system of Linear Equations by Iterative method (Gauss Siedal Method), Linear dependence and independence of vectors.

Unit 2	**Applied Matrix Algebra**	**09 hours**
Matrix factorization, LU Decomposition, Eigen Values & Eigen Vectors, diagonalization of matrix of order two, Eigen Value Decomposition and singular value decomposition.		
Unit 3	**Vector Spaces**	**09 hours**
Introduction to Vector Spaces, Basic Properties of Vector Spaces, Sub spaces, Basis and dimension, Introduction of finite and Infinite Dimensional Spaces.		
Unit 4	**Linear Transformation**	**09 hours**
Introduction to linear transformation, Matrix representation of Linear Transformation, Equivalent matrix and Similarity transformation, Rank and Nullity, Rank-Nullity Theorem (without proof), Kernel and Range. Application of Linear Transformation in image Magnification.		
Unit 5	**Inner Product Space**	**09 hours**
Introduction to inner product and norm of vectors, Orthogonality, Orthonormality, Gram-Schmidt Method, Orthonormal basis, projections using inner products; orthogonal transformations and rotations.		
	Total Lecture Hours	**45 hours**

Textbook:

1. Hoffman, K. and Kunze, R., "Linear Algebra", Pearson Education (Asia) Pvt. Ltd/ Prentice Hall of India, 2015
2. Nair, M.T. & Singh A., Linear Algebra, Springer, 2019.
3. Strang, Gilbert, Linear Algebra and its Application, Cengage Learning, 4th edition, 2005.
4. Jain, M.K., Iyengar, S.R.K. and Jain R.K., Numerical Methods, New Age International Publishers, 2019

Reference Books:

1. Schaum's Outline of Linear Algebra, McGraw Hill Education 2017
2. Strang, G., "Linear Algebra and Its Applications", Thomson Learning Asia Pvt. Ltd.4th edition ,2005.
3. Lay, Dand C., "Linear Algebra and Its Applications" Pearson Education Limited, 6th edition 2020.
4. Richard, L. Burden, J. Douglas Faires, and Annette Burden, Numerical Analysis, Cengage Learning, 10th edition, 2015.
5. Sastry S. S. "Introductory Methods of Numerical Analysis", PHI, 3rd edition 2002.

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**100**	**200**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24CSE21	**Theory Course Name: Data Structure**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**3**	**0**	**0**	**3**

Pre-requisite: The course requires background in mathematics and sufficient programming skills.

Course Objectives:

1. To provide a deep understanding of fundamental data structures and their applications.
2. To provide expertise in the efficient implementation of physical and logical data structures.
3. To provide insight into the working of searching and sorting algorithms.
4. To develop the analytical ability for solving real-world problems using the data structure.

Course Outcome: After completion of the course, the student will be able to

1. Use the concept of the array in searching and sorting algorithms.
2. Illustrate the concept of Dynamic Memory Allocation for operations on linked list.
3. Analyze different recursion techniques using stack.
4. Analyze the fundamental concept of queues.
5. Apply the knowledge of tree and binary search tree structures for problem solving.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	1	-	1	1	-	-	-	-	-	2	2	-
CO2	3	2	2	1	1	1	-	-	-	-	-	2	2	-

CO3	3	2	2	1	1	1	-	-	-	-	-	2	2	-
CO4	3	2	2	1	1	1	-	-	-	-	-	2	2	-
CO5	3	2	1	-	1	1	-	-	-	-	-	2	2	-

Unit 1	**Introduction**	**10 hours**

Basic Terminology, Types and application of Data Structures, Algorithm, Efficiency of an algorithm, Time space trade off and complexity, asymptotic notation. Array: Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices, and their representations, arithmetic operations on matrices. Searching: Linear search, Binary Search, Indexed Sequential search Sorting: Insertion Sort, Bubble sort, Selection sort, Quick Sort, Merge Sort, Merge Sort.
Application Area: Matrix, Dynamic Programming, Redix Sort, Bucket Sort Buffer or Cache, Stack & Queue, Graph Representation, Tree, Image Processing, Signal Processing, Databases, Web Search Engines, Networking Routing

Unit 2	**Linked Lists**	**09 hours**

Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Reversing, Polynomial Representation and Addition. Generalized Liked list.
Application Area: Symbol table implementation, Memory Management, Tries, Tree, Graph, Music and Video Playlists, Undo/Redo Functionality, Hash Tables and Collision Resolution

Unit 3	**Stack**	**08 hours**

Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked List Implementation of Stack, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Tail recursion, Head Recursion, Nested recursion, Removal of recursion. Problem solving using iteration and recursion with examples such as Fibonacci numbers, and Hanoi towers. Trade-offs between iteration and recursion.
Application Area: Function Call Stack, Optimal Parentheses Problem in Matrix multiplications, Backtracking, Depth-First Search, Parsing and Compiler Design, Process Control Block, Memory Management.

Unit 4	**Queue**	**08 hours**

Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues, Double Ended queue, and Priority Queue.
Application Area: Job Scheduling, Breadth-First Search, Search Trees and Binary Search Tree, Database Operations, Customer Service, Web Server Request Handling, Buffering and Data Streaming, Traffic Management.

Unit 5	**Trees**	**10 hours**

Binary Tree and Its array and linked list representation, Strict Binary Tree, Complete Binary Tree, Tree Traversal algorithms: In-order, Pre-order and post-order, level order, Constructing Binary Tree from given Tree Traversal, BST Operation: Searching, Insertion, Deletion, Threaded Binary Trees, Traversals in Threaded Binary Trees, Heaps, Heap Sort
Application Area- Dictionary Implementation, Compiler Design, Graph Algorithms, In order Traversal Optimization

	Total Lecture Hours	**45 hours**

Textbook:

1. Horowitz, E., Sartaj Sahni, & Anderson-Freed, S. (2008). Fundamentals of data structures in C. University Press.
2. Lipschutz, S. (2014). Data structures. Mcgraw Hill Education (India) Private Limited.
3. Deshpande, P. S., & Kakde, O. G. (2009). C and data structures. Dreamtech Press.
4. Aaron M. Tenenbaum, Langsam, Y., & Augenstein, M. (2003). Data Structures Using C.

Reference Books:

1. Aho, A. V., Hopcroft, J. E., & Ullman, J. D. (2009). Data Structures and algorithms. Dorling Kindersly.
2. Kruse. (n.d.). Data Structures and Program Design in C. Pearson Education India.
3. Kernighan, B. W., & Ritchie, D. M. (2015). The C programming language. Pearson.
4. Van, P. (1994). Expert C programming: deep C secrets. Sunsoft Press.
5. Deitel, P., & Deitel, H. (2016). C How to Program, Global Edition. Pearson Higher Ed.

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
30	**30**	**4**	**4**	**4**	**3**	**4**		
60		**Best of 4 (15)**					**75**	**150**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EEE23	**Theory Course Name: Emerging Technologies for Engineers**	**L**	**T**	**P**	**C**
Course Offered in: EEE/ME		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

1. To learn the basic concepts of cloud computing and its underlying technologies with its implementation.
2. To learn the basic concepts of Blockchain and its underlying technologies with its implementation.

Course Outcome: After completion of the course, the student will be able to

1. Understand the concepts of Industry 1.0 to Industry 5.0 & 5G technology.
2. Apply the MATLAB for Engineering Applications
3. Understand the concepts of cloud computing
4. Understand the concepts of block chain.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	3	-	-

Unit 1	**Evolution of Industrial Revolutions**	**08 hours**

Evolution of industrial revolutions: From Industry 1.0 to Industry 5.0**.** Definition and components of Industry 5.0. Introduction to **IoT** and its role in Industry 5.0. Role of 5G technology in enabling new applications.

Unit 2	**MATLAB for Engineering Applications**	**08 hours**

Importance of MATLAB in Engineering. MATLAB Programming basics, arrays, and functions. Matrix operations, plotting, and visualization tools. MATLAB Simulink basics for system modelling and simulation. Interfacing MATLAB with hardware (Arduino and DAQ).

Unit 3	**Cloud Computing**	**08 hours**

Definition and characteristics of cloud computing. Evolution of cloud computing: From grid computing to utility computing. Cloud architecture and key components. Overview of AWS architecture and services. Overview of GCP architecture and services.

Unit 4	**Blockchain**	**06 hours**

Introduction to Blockchain. Fundamentals, Principles and Technologies, Cryptocurrencies, Smart Contracts, Blockchain Applications.

	Total Lecture Hours	**30 hours**

Textbook:

1. Mastering Cloud Computing: Foundations and Applications Programming Book by Christian Vecchiola, Rajkumar Buyya, and S. Thamarai Selvi
2. Cloud Computing – Concepts, Technology and Architecture Pearson Thomas Erl

Reference Books:

1. Cloud Computing Master the Concepts, Architecture and Applications with Real- world examples and Case Studies by Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi.
2. Block Chain: Blueprint for a New Economy, O'Reilly, Melanie Swan
3. Blockchain Basics: A Non-Technical Introduction in 25 Steps by: Daniel Drescher.

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
20	**20**	**2**	**2**	**3**	**3**	**3**		
40		**Best of 4 (10)**					**50**	**100**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24EEE24	**Theory Course Name: Digital Logic Design**	**L**	**T**	**P**	**C**
Course Offered in: EEE		**2**	**0**	**0**	**2**

Pre-requisite: Introduction to Computers.

Course Objectives:

1. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
2. To implement simple logical operations using Minimization Techniques.
3. To design combinational logic circuits.
4. To design sequential logic circuits.

Course Outcome: After completion of the course, the student will be able to

1. Understand various types of number systems and their conversions.
2. Simplify the Boolean expressions and apply the Boolean theorems through logical gates.
3. Design and implement variety of logical devices using combinational circuits concepts.
4. Analyze sequential circuits like Registers and Counters using flip-flops.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	3	-	-

Unit 1	**Number System and Boolean Algebra**	**08 hours**

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes. Digital Logic Gates (AND,NAND,OR,NOR,EX-OR,EX-NOR), Properties of XOR Gates, Universal Gates, Basic Theorems and Properties, Switching Functions, Canonical and Standard Form.

Unit 2	**Minimization Techniques**	**08 hours**

Introduction, The minimization with theorems, The Karnaugh Map Method, Three, Four and Five variable K- Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Quine-McCluskey Method, Multilevel NAND/NOR realizations.

Unit 3	**Combinational Circuits**	**07 hours**

Design Procedure – Half Adder, Full Adder, Half Subtractor, Full Subtractor, Parallel Binary Adder, Parallel binary subtractor, Binary Multiplier, Multiplexers/De-Multiplexers, decoder, Encoder, Code Converters, Magnitude Comparator. Classification of sequential circuits, The binary cell, The S-R-Latch Flip-Flop The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The "Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Timing and Triggering Consideration.

Unit 4	**Sequential Circuits**	**07 hours**

Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, Latches, Flip-Flops, SR,JK,D,T and Master slave, characteristic Tables and equations, Conversion from one type of Flip-Flop to another, Counters - Design of Single Mode Counter, Ripple Counter, Ring Counter, Shift Register, Ring counter using Shift Register.

	Total Lecture Hours	**30 hours**

Textbook:

1. Digital Logic and Computer Design by M. Moris Mano, 4th Edition.
2. Digital Principles and Applications by Leach, Paul Malvino, 5th Edition.

Reference Books:

1. Fundamentals of Digital Logic Design by Charles H.Roth, Jr. 5th Edition, Cengage
2. Digital Electronics by G.K. Kharate, Oxford University Press
3. Switching Theory and Logic Design by A. Anand Kumar, PHI, 2nd Edition

Mode of Evaluation

MSE		CA					ESE	Total
MSE1	MSE2	CA1	CA2	CA3	CA4 (ATT)	CA5		
20	20	2	2	3	3	3		
40		Best of 4 (10)					50	100

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Theory Course Code: K24ME22	**Theory Course Name: Engineering Mechanics**	**L**	**T**	**P**	**C**
Course Offered in: ME		**2**	**0**	**0**	**2**

Pre-requisite: NA

Course Objectives:

1. To learn the application of principles of mechanics.
2. To learn the concept of centroid and moment of an area.
3. Familiarization of the concept of motion of particles and rigid bodies.

Course Outcome: After completion of the course, the student will be able to

1. Analyze shear forces and bending moments for different beam configurations and loading conditions.
2. Analyze truss structures using methods of joints and sections.
3. Calculate centroids, centers of gravity and moment of inertia for composite sections.
4. Apply the basic principles of kinematics and kinetics of rigid bodies.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	2	-	-

Unit 1	**Introduction to Beams**	**08 hours**

Basic concepts, Shear Force and Bending Moment Diagram for Cantilever Beam, Simply Supported Beam and Overhanging Beam with Concentrated Load, Distributed Load and Couple, Relation Between Shear Force and Bending Moment, Case study on practical applications of different beams and its loadings.

Unit 2	**Analysis of Structures**	**07 hours**

Types of truss and assumptions, Analysis of plane trusses by method of joints and method of section, Case study of truss applied to different type of structures. Friction - Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Impending motion of Bodies, Practical applications of friction in different machines.

Unit 3	**Centroid and Centre of Gravity**	**07 hours**

Centroid from first principle, centroid of composite sections; Centre of Gravity from first principle, Centre of Gravity of composite sections. Moment of Inertia – Area moment of inertia, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of composite sections; Mass moment of inertia of circular plate, Cylinder, Cone, Sphere, Radius of Gyration. Case study on practical applications of CG and MI.

Unit 4	**Kinematics of rigid body**	**08 hours**

Basic terms, Types of motion, plane motion of rigid body, velocity and acceleration under translational, rotational motion and general principles in dynamics; Instantaneous center of rotation in plane motion, relative velocity. Practical examples and real-life applications of concept. Kinetics of rigid body – D' Alembert's principle and its applications in plane motion and connected bodies; Impulse-Momentum principle, Work-energy principle and its application in plane motion of connected bodies; Kinetics of rigid body in rotation, Practical examples and real-life applications of concept.

	Total Lecture Hours	**30 hours**

Textbook:

1. Engineering Mechanics by S S Bhavikatti, 7th Multi colour Edition.
2. Engineering Mechanics, R.K. Bansal, Laxmi Publications.
3. Engineering Mechanics, R.S. Khurmi, S.Chand Publishing.

Reference Books:

1. Meriam J.L. and Kraige L.G., Engineering Mechanics-Statics-Volume 1, Dynamics-Volume 2, Third Edition, John Wiley & Sons (1993).
2. Mechanics of Materials by James M. Gere and Barry J. Goodno
3. Structural Analysis by Russell C. Hibbeler
4. Mechanics of Materials by Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, and David F. Mazurek

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
20	**20**	**2**	**2**	**3**	**3**	**3**		
40		**Best of 4 (10)**					**50**	**100**

CA5: Participation in any Hackathon, National/International Activity or Research Paper Publication.

Lab's/Practical's Courses Detail Syllabus

Theory Course Code: K24AS12P/K24AS22P	**Theory Course Name: Semiconductor Physics and Devices Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

To impart the technical aspect of semiconductor Physics and devices to engineering graduates so that they are able to assess and contribute to the solution of technical and engineering problems that are based on broad principles of Physics including solid state physics, semiconductors, optoelectronics devices and Quantum Physics.

Course Outcome: After completion of the course, the student will be able to

1. Illustrate the basic concept of crystalline materials and their appropriate use.
2. Apply the fundamentals of basic semiconductor Physics on transistor and MOSFET.
3. Apply the concepts of semiconductor Physics in aspect of solar cell and Zener diode.
4. Implementing of semiconductor Physics to study various characteristics of optoelectronic devices.
5. Apply the concept of Quantum Physics to study various phenomenon.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	2	2	-	-	2	-	3
CO2	3	2	-	-	-	2	2	-	-	2	-	3
CO3	3	2	-	-	-	2	2	-	-	2	-	3
CO4	3	2	-	-	-	2	2	-	-	2	-	3
CO5	2	1	-	-	-	-	-	-	-	1	-	2

List Of Practical's (Indicative & Not Limited To)

1. To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor using Hall Effect set up.
2. Using solar cell Trainer (a) study voltage and current of a solar cell (b) Voltage and current in series and parallel combinations (c) Draw power curve to find maximum power point (MPP) and to obtain efficiency of a solar cell.
3. To determine the energy band gap of a given semiconductor material by four probe method.
4. To study the characteristics of NPN/PNP transistors.
5. To study the V-I characteristics of MOSFET.
6. To plot the graph of V-I characteristics of a Zener diode.
7. To determine the wavelength of Laser light using diffraction phenomena.
8. To find the fiber attenuation and numerical aperture of a given optical fibre.
9. To study the presence of discrete energy levels in an atom by Franck Hertz experiment.
10. To determine Planck's constant and work function using Photo-electric effect.

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24EC11P/K24EC21P	**Theory Course Name: Computer Organization & Logic Design Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. Explore the basics of digital logic, including number systems and logic gates.

2. Perform the analysis and design of various digital electronic circuits.
3. Explore the knowledge of Computer organization and memory concepts.
4. Work in a team to demonstrate an application of digital circuits by engaging in self-learning.

Course Outcome: After completion of the course, the student will be able to

1. Apply the basics of binary arithmetic and codes in digital system design.
2. Design combinational logic circuits using Boolean functions and gate-level minimization
3. Design sequential logic circuits, including latches, flip-flops, registers, and counters.
4. Understand computer organization, including bus architecture, processor organization, and I/O systems.
5. Understand memory organization, cache, and virtual memory.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	-	-	-	-	-	-	-	-
CO2	3	3	2	2	1	1	-	-	-	-	-	-	2	-
CO3	3	3	2	2	1	1	-	-	-	-	-	-	2	-
CO4	3	3	2	2	2	2	-	-	-	-	-	-	-	-
CO5	3	3	2	2	1	1	-	-	-	-	-	-	2	-

List Of Practical's (Indicative & Not Limited To)

1. Investigate logic behaviour of AND, OR, NOT, NAND, EX-OR, EX NOR Gates. Realization of Boolean Expressions using Gates and minimization using Karnaugh Map.
2. Design and verification of the truth tables of Half, Full adder.
3. Design and verification of truth table of decoder and multiplexer circuits.
4. Design and implement 2- bit magnitude comparator.
5. Verification of truth tables of SR, J-K, and D Flip-Flops.
6. Design and verify all types of Shift Registers.
7. Design and verify the 2-Bit Synchronous and Asynchronous Counter.
8. Design memory units (single bit RAM cell) and understand how it operates during read and write operation.

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24IT11P	**Theory Course Name: Programming for Problem Solving Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. Given a computational problem, identify and abstract the programming task involved.
2. Approach the programming tasks using techniques learned and writepseudo-code.
3. Choosethe right data representation formats based on the requirements of the problem.
4. Use comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
5. By learning the basic programming constructs, students can easily switch over to any other language in future.

Course Outcome: After completion of the course, the student will be able to

1. Apply programming constructs of C language to solve real-world problems.
2. Use the concepts of looping, branching, and decision-making statements for a given problem.
3. Develop Solutions to problems using modular programming constructs such as functions and recursion.
4. Demonstrate the ability to write C programs using pointers, strings structures and unions.
5. Design a solution to problems using the concepts of pointers and files handling.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	1	-	-	-	2	-	2
CO2	3	3	-	2	2	-	-	1	-	-	-	2	-	2
CO3	3	3	-	2	2	-	-	1	-	-	-	2	-	2
CO4	3	3	2	2	2	-	-	1	-	-	-	2	-	2
CO5	3	3	2	2	2	-	-	1	-	-	-	2	-	2

List Of Practical's (Indicative & Not Limited To)

1.

a. Write a C program to input two integer numbers and perform addition, subtraction, division and multiplication.
b. Accept any two numbers, if the first number is greater than the second then print the sum of these two numbers, otherwise print their difference. Write this program using the ternary operator.
c. Write a program to accept the principal, rate, and number of years and find out the simple interest and compound interest.
d. Write a C program to swap values of two variables with the help of a third variable and without using a third variable.
e. Write a C program allows the user to input a floating-point number. The program then extracts an integral part of the number and finds its rightmost digit. By utilizing suitable algorithms and logic, the program accurately identifies the digit at the furthest right position in an integral part of the given number.
f. Write a C program to add two numbers together without utilizing the conventional + operator. The program employs alternative techniques and logical operations to achieve the addition operation. By leveraging bitwise operations, such as bitwise XOR (^) and bitwise AND (&), along with bit shifting, the program cleverly performs the addition operation on each bit of the two numbers.
g. Write a C program to determine whether a given year is a leap year or not using the conditional operator. The program takes advantage of the conditional (ternary) operator?:, which allows for concise conditional expressions. The leap year check is performed based on the following criteria: a year is a leap year if it is divisible by 4, but not divisible by 100 unless it is also divisible by 400.
h. Write a C program to multiply two given numbers without using the * operator. The program takes advantage of the concept of repeated addition to perform multiplication. It prompts the user to input two numbers and utilizes a loop to iteratively add the first number to a running sum until the second number is reached.
i. Write a C program to determine the largest among three given numbers using the conditional operator (?:).The program prompts the user to input three numbers and utilizes the conditional operator to compare and determine the largest number among them.

2.

a. Write a menu-driven program using the Switch case to calculate the following:
   - Addition of two numbers
   - Difference between two numbers
   - Product of two numbers
   - Division of two numbers
   - HCF of two numbers
   - LCM of two numbers
b. Write a program to input an integer number and check whether it is prime or not.
c. Write a program to print prime numbers between 1 to 100.
d. Write a program to find reverse of a number and check whether it is palindrome or not.
e. Write a program to find the sum of the series given below:
   - $x - x^3/3! + x^5/5! - x^7/7!$ +------- up to n terms.
   - $1 + (1+2) + (1+2+3) + (1+2+3+4)$ +--------up to n terms.
f. Write a C program to check whether all the bits of a given number are unset or low. The program prompts the user to input a number and uses bitwise operators and logical operations to perform the check. The program utilizes the bitwise AND (&) operator with a bit mask that has all bits set to 0 except for the bit in the position being checked. By performing the bitwise AND operation between the number and the bit mask for each bit position, the program determines if the bit is unset or low.
g. Write a C program to read a list of integers using a loop and calculate the number of distinct prime factors for each integer in the list. The program prompts the user to input the number of integers they want to enter, followed by the actual integers. It then utilizes loops, conditional statements, and a prime factorization algorithm to determine the distinct prime factors for each integer.

h. Write a C program to address the scenario where a company decides to give bonuses to its employees on the occasion of the new year. The program allows the user to enter the salary and gender of each employee and calculate the bonus based on the specified criteria. It also displays the final salary that each employee will receive, taking into account the applicable bonuses To calculate the bonus, the program uses conditional statements based on the employee's gender and salary. If the employee is male, a 5% bonus is applied to the salary. If the employee is female, a 10% bonus is applied. Additionally, if the salary is less than 10000, an extra 2% bonus is given to the employee. The program applies these bonuses using appropriate calculations and stores the final salary in a variable.

i. Write a C program to print the following pattern:

```
        1
      1 2 3
    1 2 3 4 5
  1 2 3 4 5 6 7
1 2 3 4 5 6 7 8 9
  1 2 3 4 5 6 7
    1 2 3 4 5
      1 2 3
        1
```

j. The task at hand is to write a C program that displays a specific pattern. The pattern consists of a series of numbers arranged in a triangular shape. Each row of the pattern follows the ascending and descending order of numbers:

```
      1
    1 2 1
  1 2 3 2 1
1 2 3 4 3 2 1
1 2 3 4 5 4 3 2 1
```

3.

a. The task at hand is to design a simple calculator program that will assist a doctor in examining the performance of a 13-year-old boy with exceptional mental math skills. The program will allow the doctor to input two numbers and choose an operation (addition, subtraction, multiplication, or division) to be performed on those numbers. The program will prompt the doctor to enter the two numbers and provide a menu of available operations. Based on the doctor's selection, the program will perform the chosen operation on the input numbers and display the result.

b. The task at hand is to design a program in C that converts a decimal number to its binary representation using a function. The program will prompt the user to enter a decimal number, and then it will call the conversion function to convert the decimal number to binary. The conversion function will take the decimal number as input and perform the necessary calculations to generate its binary equivalent. It will employ mathematical operations, such as division and modulus, to extract the binary digits. The function will store the binary digits in an array or a string, representing the binary number. The program should handle various scenarios, such as positive decimal numbers, negative decimal numbers, and zero, while accurately converting them to binary. It should also handle any potential errors or limitations, such as exceeding the range of data types used for storing the decimal and binary numbers.

c. The task at hand is to design a program in C that counts the occurrence of each digit in a given number using recursion. The program will prompt the user to enter a number, and then it will call a recursive function to count the occurrence of each digit in that number.

d. Write a C program that multiplies two matrices using recursion. The program prompts the user to enter the dimensions and elements of two matrices. It then recursively computes the product of the two matrices and displays the resulting matrix. To perform matrix multiplication using recursion, the program defines a recursive function. This function takes the two matrices, their dimensions, and the current row and column indices as parameters. At each recursive call, the function multiplies the corresponding row of the first matrix with the corresponding column of the second matrix and calculates the sum of the products.

e. The task is to write a C program that calculates the sum of a series using a function. The series is defined as follows:
x - (x^3 / 3!) + (x^5 / 5!) - (x^7 / 7!) + (x^9 / 9!) + ... (up to n terms)
Here, 'x' is a given input value, and 'n' represents the number of terms in the series. To solve this task, the program will define a function that takes 'x' and 'n' as parameters and returns the sum of the series. The function will use a loop to iterate through the terms of the series and calculate the value of each term based on the given formula. The sum of all the terms will be accumulated and returned as the final result. The program will also prompt the user to enter the values of 'x' and 'n', and then it will call the function to
compute the sum of the series. Finally, the program will display the result to the user.

f. The program is designed to calculate and print a table of binomial coefficients using the provided formula. Binomial coefficients, denoted as B(m, x), are calculated using the formula B(m, x) = m! / (x! * (m - x)!), where m is the total number of elements, and x is the number of elements chosen at a time. The program prompts the user to enter the values of 'm' and 'x'. It then calculates the binomial coefficient for each combination of 'm' and 'x' that satisfies the condition m > x. The factorial

function is used to calculate the factorials involved in the formula. The program generates a table displaying the binomial coefficients for the given range of 'm' and 'x'. The table is printed in a formatted manner, making it easy to read and understand. Each row of the table corresponds to a specific 'm' value, and the columns represent the corresponding 'x' values. The table provides a comprehensive view of the binomial coefficients, showing the number of ways to choose 'x' elements from a set of 'm' elements. This information can be useful in various mathematical and statistical calculations, such as combinatorics, probability, and algebraic equations.

4.

a. The C program is designed to find the median of two sorted arrays. It takes two input arrays, both of which are assumed to be sorted in ascending order. The program determines the median value by combining the elements from both arrays and finding the middle value(s) in the merged array. To achieve this, the program follows a divide-and-conquer approach. It calculates the midpoints of the two arrays and compares the corresponding elements at those positions. Based on the comparison, it discards the elements that are guaranteed to be less than the median. The process continues recursively until the median is found. If the total number of elements in the combined array is odd, the median is the middle element. If the total number of elements is even, the median is the average of the two middle elements.
b. The program aims to find the largest number in an array using recursion. It takes an array of integers as input and recursively searches for the largest number within the array. The program uses a recursive function to compare elements of the array. It starts by assuming the first element of the array is the largest. Then, it recursively compares this assumed largest number with the remaining elements of the array. If a larger number is found, it becomes the new assumed largest number. This process continues until all elements of the array have been compared.
c. The program aims to find the nearest lesser and greater elements in an array based on a given target number. The user is prompted to enter the size of the array and the array elements. Additionally, the user provides a target number for comparison. The program then determines the nearest lesser and greater elements in the array in relation to the target number.The algorithm begins by initializing the nearest lesser and greater variables as the minimum and maximum possible values, respectively. It iterates through each element of the array, comparing it with the target number. If the element is smaller than the target number and greater than the current nearest lesser value, it becomes the new nearest lesser. Similarly, if the element is larger than the target number and smaller than the current nearest greater value, it becomes the new nearest greater.
d. The task is to write a C program that removes duplicate elements from an array. Given an array containing integers, the program should identify and eliminate any duplicate elements, leaving only the unique elements in the array. The program should modify the original array in-place and update its size accordingly. The program will iterate through the array and compare each element with the remaining elements in the array. If a duplicate element is found, it will be removed by shifting the subsequent elements to the left, effectively overwriting the duplicate element. The size of the array will be reduced by one for each duplicate element encountered.
e. The task is to write a C program that sorts a list of names in alphabetical order. Given an array of strings representing names, the program should rearrange the names such that they are sorted in ascending order based on the alphabetical order. The program will use a sorting algorithm to compare pairs of names and swap them if they are out of order. It will continue this process until the entire list is sorted. The sorting algorithm can be implemented using various techniques such as bubble sort, insertion sort, selection sort, or more efficient algorithms like quicksort or merge sort.
f. The task is to write a C program that reads a string from the user and uses a function to reverse the order of words in the string. The program will prompt the user to enter a string and then call a function to reverse the order of the words in the string. The program will analyze the input string and identify the words based on spaces or any other specified delimiters. It will then reverse the order of these words while maintaining the order of the characters within each word. For example, if the input string is "Hello World, how are you?", the program will reverse the words to form the output string "you? are how World, Hello". The program will implement the logic to reverse the words by using string manipulation techniques such as splitting the string into words, storing them in an array, and then rearranging the words in reverse order. It will handle cases where there are multiple spaces between words and ensure that the resulting string maintains the original spacing. After reversing the order of the words, the program will display the modified string to the user. The reversed string will reflect the reversed order of the words while preserving the characters within each word

5.

a. Write a C program which efficiently store and manage records of N students. The program allows the user to input the details of each student, including their name, along with other relevant information. Once all the records are entered, the program implements a sorting algorithm to arrange the student records in ascending order based on their names.
b. The C program is designed to store records of N students and sort them according to their marks. The program utilizes data structures and sorting algorithms to efficiently organize the student records based on their performance. It prompts the user to enter the number of students (N) and then dynamically allocates memory to store the required number of records. For each student, the program prompts the user to enter their name and marks. After storing all the records, it proceeds to sort them in ascending order based on the marks achieved by each student.

c. The C program uses a pointer to a structure to initialize the members within the structure. It also utilizes functions to print the student information. The program allows the user to input data for multiple students and stores the information in the structure using pointer notation. It then calls the appropriate functions to display the student details on the screen. By utilizing pointers to structures, the program optimizes memory usage and enables efficient manipulation of the student data.

6.

a. This C program utilizes pointers to check whether a given string is a palindrome or not. It prompts the user to enter a string and then uses pointer manipulation to compare characters from both ends of the string. By iterating through the string using pointers, the program checks if the characters at corresponding positions are the same or not. If all the characters match, the program concludes that the string is a palindrome. Conversely, if any pair of characters does not match, the program determines that the string is not a palindrome.

b. Write a C program allows the user to store n elements in an array and then utilizes a pointer to print the elements. The program prompts the user to enter the number of elements (n) they wish to store in the array. It dynamically allocates memory for the array based on the user's input. Next, the program asks the user to input the n elements one by one. After storing the elements in the array, it uses a pointer to iterate through the array and print each element. By leveraging pointer arithmetic, the program efficiently accesses the array elements and displays them to the user. This program provides a dynamic and pointer-based approach to store and print array elements in C.

c. Write a C program to utilize dynamic memory allocation to find the largest element in an array. It prompts the user to enter the number of elements they wish to store in the array. Using this input, the program dynamically allocates memory for the array.

d. Write a C program allows the user to replace a specific line with another text in a file. The program prompts the user to enter the name of the file and the line number they want to replace. It then asks the user to input the new text that will replace the specified line. This program defines a function encrypt File that takes the path to an input file, the path to the output file, and an encryption key as parameters. It reads the input file line by line and encrypts each character using the provided key. The encrypted characters are then written to the output file.

e. Write a C program to perform basic operations on linked list: Creation, insertion, deletion, and traverse in linked list.

Total Hours: 30 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 10	CA2 20	CA3 20		
50			50	100

Theory Course Code: K24EEE11P/K24EEE21P	**Theory Course Name: IoT and Embedded Systems Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. The course aims to provide exposure to the applications of IoT in smart cities and industrial applications.
2. It aims to train the students to the basic concepts of the Embedded C.
3. It aims to train the students to the basic concepts of the Controller.
4. This course is designed to give the students hands-on experience with the Software and Hardware concepts.

Course Outcome: After completion of the course, the student will be able to

1. Understand the basic concepts of sensors and transducers.
2. Understand basics of embedded system and different IoT boards.
3. Apply basic operations and programming techniques of IoT devices.
4. Apply smart technology knowledge through case studies.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	2	2	2	-	-	-	-	2	-	2
CO2	2	-	2	-	2	2	2	-	2	-	-	2	-	2
CO3	3	-	3	2	3	2	2	-	2	-	-	2	-	3
CO4	3	2	3	3	3	2	2	-	2	-	-	2	-	3

List Of Practical's (Indicative & Not Limited To)

1. Understanding the Architecture and Pin Configuration of ESP8266 and Arduino Boards.
2. Hands-On Introduction to commonly used real world IoT Sensors.
3. Analyze Digital signal data acquisition using Arduino and ESP8266.
4. Explore Digital signal generation using Arduino and ESP8266.
5. Analyze Analog signal data acquisition using Arduino.
6. Explore Analog signal generation using Arduino.
7. Real-Time Data Logging Using ESP8266 and Arduino.
8. Designing a Lighting Control System using LDR.
9. Designing a Multi-Sensor Alert System Using Touch, IR, PIR and Arduino.
10. Object Detection Using Ultrasonic Sensors with Arduino and ESP.

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24ME11P/K24ME21P	**Theory Course Name: Design & Realization Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. To familiarize students with the modern technologies used in industries.
2. To realize the fundamentals of Computer Aided Design & digital manufacturing.

Course Outcome: After completion of the course, the student will be able to

1. Create 2D and 3D models using Computer Aided Design software.
2. Apply 3D modelling techniques and STL file preparation for additive manufacturing.
3. Create a model using 3D printer.
4. Develop engineering components using CNC/VMC machine.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

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

List Of Practical's (Indicative & Not Limited To)

1. Introduction to 2D drawing, shapes like rectangles, circles, polygons, and then modify them using tools like trim, extend, and fillet. Apply appropriate dimensions.
2. Applying constraints in 2D and 2D sketching.
3. 3D modelling of components using extrusion, revolve, loft, sweep, and multiple features.
4. Create an assembly of multiple parts with accurate mate constraints to simulate their interaction.

5. Slicing of STL file and study of the effect of process parameters like layer thickness, orientation and infill on build time using software.
6. Create a 3D printed component.
7. Create a small component using CAD file using CNC machine.
8. Create a general use component using CAD file using VMC machine.

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24IT12P	**Theory Course Name: Web Designing Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. Provide students with a good understanding of the basic concepts of web design, using HTML, CSS, and JavaScript.
2. Enable students to analyse web pages using various formatting techniques of CSS and HTML.
3. Enable students to process webpage data on client machines in integration with html using JavaScript.
4. Apply the techniques of CSS, HTML and JavaScript for designing competitive websites.

Course Outcome: After completion of the course, the student will be able to

1. Understand the concept of layout and structure of Hypertext markup language (HTML)
2. Apply the integration of Cascading style sheets (CSS) in HTML pages.
3. Apply the JavaScript concept to process and validate the data of a web page on client Machine.
4. Design the website with the application of HTML, CSS and JavaScript.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

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

List Of Practical's (Indicative & Not Limited To)

1. Design the following static web pages required for an online bookstore website.

HOMEPAGE:

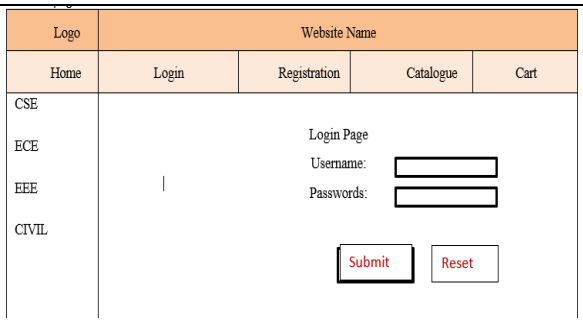
- The static home page must contain three **frames**.
- Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

For example: When you click the link **"CSE"** the catalogue for **CSE** Books should be displayed in the Right frame. Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Website			

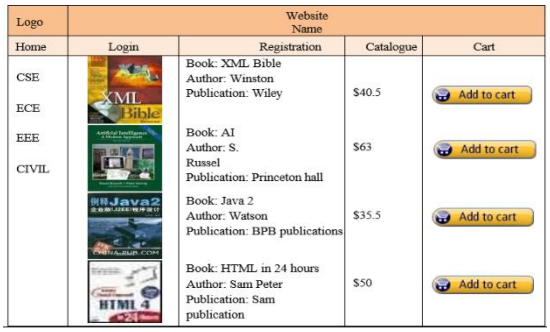
2. LOGINPAGE:

This page looks like below:



3. **CATOLOGUE PAGE:** The catalogue page should contain the details of all the books available in the website in a table. The details should contain the following:

a. Snapshot of Cover Page.
b. Author Name.
c. Publisher.
d. Price.
e. Add to cart button.



4. **CARTPAGE:** The cart page contains the details about the books which are added to the cart. The cart page should look like this:

Logo	Web Site Name				
Home	Login	Registration		Catalogue	Cart
CSE	Book name	Price	Quantity	Amount	
ECE	Java 2	$35.5	2	$70	
EEE	XML bible	$40.5	1	$40.5	
CIVIL	Total amount	- $130.5			

5. REGISTRATION PAGE: Create a "registration form" with the following fields

a. Name (Text field)
b. Password (password field)
c. E-mail id(text field)
d. Phone Number (text field)
e. Sex (radio button)
f. Date of birth (3 select boxes)
g. Languages known (checkboxes–English, Telugu, Hindi, Tamil)
h. Address (text area)

6. JS VALIDATION: Write ***JavaScript* to validate** the following fields of the above registration page.
Name (Name should contains alphabets and the length should not be less than 6 characters).
Password (Password should not be less than 6 characters length).

7. JS VALIDATION:
E-mail id (should not contain any invalid and must follow the standard pattern(name@domain.com)
Phone Number (Phone number should contain 10 digits only).

8**. CSS:** Design a web page using **CSS (C**ascading **S**tyle **S**heets**)** which includes the following:

Use different font, styles: In the style definition you define how each selector should work(font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles. Set a background image for both the page and single elements on the page.

9. CSS:
Control the repetition of the image with the background-repeat property. Define styles for links as

i. A:link
ii. A:visited
iii. A:active
iv. A:hover

10. Consider a small topic of your choice on which you can develop static Webpages and try to implement all topics of html, CSS and Js within the topic. Choose any one topic.
    i. Your Own Portfolio
    ii. To-Do List
    iii. Survey Form
    iv. A Tribute Page
    v. A Questionnaire

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 10	CA2 20	CA3 20		
50			-	50

Theory Course Code: K24AI11P/K24AI21P	**Theory Course Name: Introduction to AI Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE(AI)/CSE(AIML)		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

The objective of this course is to provide students with a solid understanding of AI principles and applications, gain insights into robotics, computer vision and natural language processing, explore ethical considerations, and acquire hands-on skills in implementing AI solutions for real-world scenarios.

Course Outcome: After completion of the course, the student will be able to

1. To understand the fundamental concepts, theories, and techniques in artificial intelligence (AI), and attain proficiency in implementing and utilizing search algorithms, heuristics, and game playing strategies.
2. To understand different methods of knowledge representation and learning to apply these techniques to capture and utilize domain-specific knowledge in AI systems.
3. Develop insights into the challenges and techniques associated with applying AI of Natural Language Processing (NLP), Computer Vision, and Robotics.
4. Acquire knowledge of the ethical considerations related to AI, encompassing fairness, transparency, and accountability and analyze the societal impacts of AI technologies to develop a comprehensive understanding of responsible AI practices and futuristic domains.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3			2	2		3	3	2	2
CO2	3	3	3	3	3			2	2		3	3	2	2
CO3	3	3	3	3	3			2	2		3	3	2	2
CO4	3	3	3	3	3			2	2		3	3	2	2

List Of Practical's (Indicative & Not Limited To)

1. n-Queens problem using Local Search.
2. n-Queens problem using Constraint Satisfaction.
3. Customer Segmentation data visualization
4. Data Augmentation Image annotation
5. Data Pre-processing
6. Image Classification and Dataset Creation
7. Implementation of Decision Tree
8. Implementation of K-means.
9. Implementation of Neive Bays
10. Chatbot

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24EC13P	Theory Course Name: Intelligent Health Care Systems Lab	L	T	P	C
Course Offered in: ECE		0	0	2	1

Pre-requisite: NA

Course Objectives:

1. Explore Fundamentals of Health Care and the Role of Intelligent Systems in Health Care System.
2. Realize Health Care Technologies with Emerging Trends and Innovations.

Course Outcome: After completion of the course, the student will be able to

1. Apply the Fundamentals of Health Care Systems
2. Explore the Role of Intelligent Systems in Health Care.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	-	1	-	-	-	1		3
CO2	3	3	2	2	1	1	-	1	-	-	-	1		3

List Of Practical's (Indicative & Not Limited To)

1. Design and Implement Automated Vital Signs Monitoring System.
2. Design and Implement Smart Alert System for Health Parameters.
3. Design and Implement Interactive Smart Tongue.
4. Design and Implement i-ball synchronized with eye rotation.
5. Design and Implement Machine Learning for Predictive Healthcare Analytics.
6. Design and Implement Wearable Heart Rate and SPO2 Monitor.
7. Design and Implement Portable ECG Monitoring System.
8. Design and Implement Smart Fall Detection System.
9. Design and Implement Non-invasive Glucose Monitor.
10. Design and Implement Smart Pill Dispenser.
11. Design and Implement Body Temperature Monitoring Patch.
12. Design and Implement Wearable EMG Muscle Activity Monitor.
13. Design and Implement Continuous Blood Pressure Monitor.
14. Design and Implement Wireless Health Monitoring System.

Total Hours: 15 hrs.

Mode of Evaluation

CA			ESE	Total
CA1 10	CA2 20	CA3 20		
50				50

Theory Course Code: K24EEE13P	Theory Course Name: Explorations in Electrical Engineering Lab	L	T	P	C
Course Offered in: EEE/ELCE/ME		0	0	2	1

Pre-requisite: NA

Course Objectives:

1. Implement different circuits and verify circuit concepts for DC and AC circuits.
2. Prove the various theorems used to reduce the complexity of electrical network.
3. The operation and characteristics of AC machines and DC machines.

Course Outcome: After completion of the course, the student will be able to

1. Understand the concepts of electric circuit solutions with DC supply using mesh-nodal analysis and Network Theorems.
2. Apply the concepts of electrical circuits with AC supply in single and three phase system
3. Analyze the equivalent circuit and performance of single-phase AC transformer
4. Illustrate the working principle of induction motors, synchronous machines and DC machines.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	3	-	-

List Of Practical's (Indicative & Not Limited To)

1. Verification of Kirchhoff's Laws: Conduct an in-depth analysis of Kirchhoff's Current and Voltage Laws through practical circuit experiments, validating their applications in complex electrical networks and understanding their role in circuit analysis and design.
2. Application of Superposition Theorem in Linear Circuits: Investigate the Superposition Theorem by analysing linear electrical circuits with multiple sources. Assess the theorem's effectiveness in simplifying circuit analysis and its implications for circuit design and problem-solving.
3. Exploring Thevenin's Theorem in Circuit Analysis: Study and apply Thevenin's Theorem to convert complex circuits into simpler equivalent circuits. Examine its practical use in circuit design and troubleshooting, emphasizing real-world applications and benefits.
4. Parameter Analysis of Single-Phase AC Series RLC Circuit: Analyze and determine the key parameters (resistance, inductance, and capacitance) of a single-phase AC series RLC circuit. Explore the impact of these parameters on circuit behaviour, including impedance, phase angle, and resonance.
5. Measurement and Analysis of Power Consumption in Fluorescent Lamps: Set up and measure the power consumption of a fluorescent lamp (tube light), including an analysis of efficiency and power factors. Understand the implications for energy management and cost-efficiency in lighting systems.
6. Power Measurement and Power Factor Improvement in Single-Phase AC Circuits: Measure the power and power factor of a single-phase AC series inductive circuit. Investigate methods to improve power factor using capacitors and evaluate the impact on circuit performance and efficiency.
7. Efficiency Testing of a Single-Phase Transformer: Perform a load test on a single-phase transformer to determine its efficiency. Analyze performance under varying load conditions and understand the practical considerations for transformer operation and maintenance.
8. Speed Control Techniques for DC Shunt Motors: Explore speed control methods for DC shunt motors through armature and field control techniques. Assess the effectiveness and applications of these methods in industrial and commercial motor-driven systems.
9. Starting and Reversal of Three-Phase Induction Motors with speed monitoring: Study the operation and speed reversal of three-phase induction motors. Measure and record motor speed in both forward and reverse directions, and analyze the implications for motor control and application.
10. Calibration Techniques for Single-Phase Induction-Type Energy Meters: Perform calibration of single-phase induction-type energy meters to ensure accurate measurement of electrical energy. Explore calibration methods and their significance for metering accuracy and compliance.
11. Cut-Out Sections Demonstration of Electrical Machines: Examine and discuss cut-out sections of various electrical machines, including DC machines, three-phase induction machines, single-phase induction machines, and synchronous machines. Understand their construction, operation, and design principles through hands-on exploration.
12. Overview of Electric Vehicle Components: Demonstrate and analyze the various sections of electric vehicles. Explore the design, functionality, and integration of key components, including electric motors, battery systems, and control electronics, to understand their role in modern transportation.

Total Lecture Hours | **15 hours**

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24CSE21P	Theory Course Name: Data Structure Lab	L	T	P	C
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		0	0	2	1

Pre-requisite: The course requires background in mathematics and sufficient programming skills.

Course Objectives:

1. To provide a deep understanding of fundamental data structures and their applications.
2. To provide expertise in the efficient implementation of physical and logical data structures.
3. To provide insight into the working of searching and sorting algorithms.
4. To develop the analytical ability for solving real-world problems using the data structure.

Course Outcome: After completion of the course, the student will be able to

1. Use the concept of the array in searching and sorting algorithms.
2. Illustrate the concept of Dynamic Memory Allocation for operations on linked list.
3. Analyze different recursion techniques using stack.
4. Analyze the fundamental concept of queues.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	1	1	-	-	-	-	-	2	2	-
CO2	3	2	2	1	1	1	-	-	-	-	-	2	2	-
CO3	3	2	2	1	1	1	-	-	-	-	-	2	2	-
CO4	3	2	2	1	1	1	-	-	-	-	-	2	2	-
CO5	3	2	1	-	1	1	-	-	-	-	-	2	2	-

List Of Practical's (Indicative & Not Limited To)

1. Write a program to find the sum of elements of positive and negative elements of a one- dimensional array.
2. Given an integer array nums, write a program to print true if any value appears at least twice in the array, and return false if every element is distinct.
3. Given a sorted array of distinct integers and a target value, write a program to print the index if the target is found. If not, return the index where it would be if it were inserted in order.
4. Nirobi has given a matrix C of size N x M to Rio. Also, Rio is given the position of submatrix as X1, Y1, and X2, Y2 inside the matrix. Now Rio needs to find the sum of all elements inside that submatrix. Can you help Rio in completing the task assigned by Nirobi?
5. You are given the pointer to the head node of a linked list and an integer to add to the list. Create a new node with the given integer. Insert this node at the tail of the linked list and return the head node of the linked list formed after inserting this new node. The given head pointer may be null, meaning that the initial list is empty.
6. Given head, the head of a linked list, write a program to print to determine if the linked list has a cycle in it or not.
7. You have three stacks of cylinders where each cylinder has the same diameter, but they may vary in height. You can change the height of a stack by removing and discarding its topmost cylinder any number of times.
8. Find the maximum possible height of the stacks such that all of the stacks are exactly the same height. This means you must remove zero or more cylinders from the top of zero or more of the three stacks until they are all the same height, then return the height.
9. Implement a last-in-first-out (LIFO) stack using only two queues.
10. Write a program to search a key string in the given array of strings using binary search.
11. Write a program to sort the given elements using insertion sort technique.
12. Given the root of a binary tree, write a program to print the preorder traversal of its nodes' values.
13. Given a root node reference of a BST and a key, write a program to delete the node with the given key in the BST and return the root node reference (possibly updated) of the BST.

14. Given the root of a binary tree, write a program to check whether it is a mirror of itself (i.e., symmetric around its centre).
15. Given a rooted binary tree, write a program to print the sum of all left leaves. A leaf is a node with no children. A left leaf is a leaf that is the left child of another node.

Total Lecture Hours | **15 hours**

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24ML21P	**Theory Course Name: Python for Engineers Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite:

Course Objectives:

The objective of this course is to provide students to build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions and work with datasets to create graphs and Data Frames. considerations, and acquire hands-on skills in implementing AI solutions for real-world scenarios.

Course Outcome: After completion of the course, the student will be able to

1. Design efficient algorithms to solve computational problems
2. Understand the fundamental concepts of data types, expressions and loops in Python
3. Understand and apply the concept of function arguments and Python List operations.
4. Understand and apply the concept of Python Containers like String, Tuple ,Set and Dictionary

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	2	2	3	3	3	2	2
CO2	3	3	3	3	3	2	2	2	2	3	3	3	2	2
CO3	3	3	3	3	3	2	2	2	3	3	3	3	2	2
CO4	3	3	3	3	3	2	2	1	3	3	3	3	2	2
CO5	3	3	3	3	3	2	2	1	3	3	3	3	2	2

List Of Practical's (Indicative & Not Limited To)

1. Introduction to Python: Python variables, Python basic Operators, Type Conversion, Expressions, understanding python blocks, Python Data Types, Declaring and using Numeric data types: int, float etc,
Activities:
(a) Temperature conversion, Palindrome Test, Reverse Number.
(b) Print all Strong numbers less than or equal to N.
(c) Sum and Difference of Two Numbers, Roots of Quadratic Equation."
(d)Write a python code that will read in a dictionary containing key/value pairs of names: [marks] for a list of students. Print the average of the marks array for the student's name provided, showing 2 places after the decimal.

2. Python Program Flow Control Conditional blocks: If, else and else if, simple for loops in python, For loop using ranges, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loop blocks
Activities:
(a) Count the number of even and odd numbers from a series of numbers.
(b) Print a list in reverse order (from last to the first item) using while and for-in loops.
(c) When interest compounds q times per year at an annual rate of r % for n years, the principle p compounds to an amount a as per the following formula a = p (1 + r / q) nq "
(d) Convert all lowercase letters to uppercase letters and vice versa.
(e) Program to access the index of a list, Program to append a list to the second list.
(f) Make a nested loop and a python closure to make functions to get multiple multiplication functions using closures. That is using closures, one could make functions to create multiply_with_5() or multiply_with_4() functions using closures."

3. Python Complex Data Types: Using string data type and string operations, Defining list and list slicing, Use of Tuple data type, String, List and Dictionary, Manipulations Building blocks of python programs, String manipulation methods, List manipulation, Python Functions, Organizing python codes using functions, Sort the sentence in alphabetical order/ remove punctuations from the given string

Activities:

(a) Program to get a string made of the first 2 and last 2 characters of a given string. If the string length is less than 2, return the empty string instead.
(b) You are given the first name and last name of a person on two different lines. Your task is to read them and print the following: Hello first name last name! You just delved into python."
(c) Program to create a dictionary of keys x, y, and z where each key has as value a list from 11-20, 21-30, and 31-40 respectively. Access the fifth value of each key from the dictionary
(d) Implement a Python code snippet that takes an integer n as input, followed by n space-separated integers, creates a tuple T with those integers, and then calculates and outputs the hash value of the tuple using the built-in hash() function.
(e) program to create a dictionary of keys x, y, and z where each key has as value a list from 11-20, 21-30, and 31-40 respectively. Access the fifth value of each key from the dictionary"

4. Python File Operations**:** Reading files, Writing files in python, Understanding read functions, read(), read line(), read lines(), Understanding write functions, write() and write lines(), Manipulating file pointer using seek Programming, using file operations.

Activities:

(a)Read content from one file and write it into another file.
(b)Pulling a random word or string from a line in a text file in Python
(c)Create a file where all letters of English alphabet are listed by specified number of letters on each line."
(d)Write a dictionary to a file in Python
(e)Create a file where all letters of English alphabet are listed by specified number of letters on each line.
(f) program to convert a date of yyyy-mm-dd format to dd-mm-yyyy format."

5. Python Packages: Simple programs using the built-in functions of packages matplotlib, simple programs using the built-in functions of packages NumPy, pandas etc.

Activities:

(a) Write a program in python to find maximum values over index in Data frame.
(b) Read all product sales data and show it using a multiline plot. (Data will be provided by faculty for analysis).
(c) WAP to create a 5X2 integer array from a range between 100 to 200 such that the difference between each element is 10."
(d)Case Study based LAB: Case study Based on Matplotlib, Pandas, NumPy, that work on retail sales data, Credit card transaction data etc. Students will find patterns and they will draw inferences based on statistical results that were found using the packages. (Faculty will provide case study)"

Total Lecture Hours	**30 hours**

Mode of Evaluation

CA			ESE	Total
CA1 10	CA2 20	CA3 20		
50			50	100

Theory Course Code: K24EEE23P	**Theory Course Name: Emerging Technologies for Engineers Lab**	**L**	**T**	**P**	**C**
Course Offered in: EEE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. To learn the basic concepts of cloud computing and its underlying technologies with its implementation.
2. To learn the basic concepts of Blockchain and its underlying technologies with its implementation.

Course Outcome: After completion of the course, the student will be able to

1. Understand the concepts of Industry 1.0 to Industry 5.0 & 5G technology.
2. Apply the MATLAB for Engineering Applications
3. Understand the concepts of cloud computing
4. Understand the concepts of block chain.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	2	-	-	-	-	-	-	-	3	-	-

List Of Practical's (Indicative & Not Limited To)

1. To acquire data from sensors using MATLAB.
2. To visualize data from sensors using MATLAB.
3. To implement data transmission using the MQTT protocol.
4. To log sensor data and perform analysis using MATLAB.
5. To create a real-time dashboard for visualizing IoT data using MATLAB.
6. To understand Data Analysis with AWS S3 and MATLAB.
7. To perform real-time data analysis using MATLAB and AWS services
8. To understand the basic concepts of Blockchain technology and create a simple Blockchain using MATLAB.
9. To understand MATLAB and AWS Lambda Integration.
10. To process a dataset using Google Cloud Functions and MATLAB.

Total Lecture Hours | **15 hours**

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24EEE26P	Theory Course Name: Electrical Engineering Workshop	L	T	P	C
Course Offered in: ELCE		0	0	2	1

Pre-requisite: NA

Course Objectives:

1. Develop practical skills in residential electrical wiring, including series and parallel circuits, staircase wiring, and safety devices such as isolators, MCBs, and ELCBs.
2. Acquire hands-on experience in soldering techniques, PCB assembly, and the operation of transformers, along with an understanding of electrical components and symbols.
3. Gain knowledge of substation components and domestic wiring systems, including the estimation and layout of electrical circuits for a typical BHK house.

Course Outcome: After completion of the course, the student will be able to

1. Apply residential wiring techniques, ensuring proper installation and testing of electrical components and safety devices.
2. Perform proficient soldering on PCBs, connecting components with accuracy and reliability.
3. Analyze and understand the construction, operation, and applications of transformers, rectifiers, and the key components of electrical supply systems.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	-	-	-	-	-	-	-	2	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	3	-	-

List Of Practical's (Indicative & Not Limited To)

1. To practice the use and application of workshop tools. Also, learn the Electrical and Electronics Symbols.
2. To perform the operation of two lamps in series and parallel

3.	To perform the staircase wiring and its testing
4.	To practice the soldering techniques and connecting wires, components connection to a PCB.
5.	To perform BHK house wiring including distribution board using isolator, MCB, ELCB.
6.	To study the construction and operation of a transformer.
7.	To visit the college substation and familiarize the supply system, Transformer, HT Panel and Distribution, etc.
8.	Ohm's Law Verification: Use circuit simulation software like LT spice or Multisim to design a circuit verifying Ohm's law.
9.	Sinusoidal Waveforms**:** Plot sinusoidal waveforms in MATLAB. Vary the amplitude, frequency, and phase to observe the changes.
10.	To study Diodes and Rectifiers. Building and analysing half-wave and full-wave rectifier circuits using MATLAB.

Total Lecture Hours | **15 hours**

Mode of Evaluation

CA			ESE	Total
CA1 5	CA2 10	CA3 10		
25			25	50

Theory Course Code: K24ASH01P	**Theory Course Name: Basic Proficiency in Japanese**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. To Develop basic listening, speaking, reading and writing proficiency in the target language, enabling global communication skills.
2. To Foster an understanding of intercultural communication, particularly between Indian and target-language-speaking cultures.
3. Introduce students to the global significance of the target language and appreciate its culture & ethics in international contexts.

Course Outcome: After completion of the course, the student will be able to

1. Understand how language and culture interact in global context and impact intercultural communication
2. Introduce themselves in the respective language and understand the syllables and number
3. Apply their learning in basic conversations and understand the social etiquette of professional world
4. Utilize the skills of listening, speaking and non-verbal communication in the target language

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	1	3	-	1
CO2	-	-	-	-	-	-	-	-	1	3	-	1
CO3	-	-	-	-	-	-	-	-	1	3	-	1
CO4	-	-	-	-	-	-	-	-	1	3	-	1
CO5	-	-	-	-	-	-	-	-	1	3	-	1

Unit 1 | **Basic Component of Japanese** | **09 hours**

- Express and understand basic greetings
- Say his/her name and ask others
- Ask, answer and understand questions on nationality
- Identify, say and understand numbers from 1-20
- Orally present oneself briefly. (using simple adjectives)
- Recognize and spell correctly alphabet in **Japanese**
- Understand and use basic classroom instructions.

Unit 2 | **Shopping and Dining in Japan** | **09 hours**

- Topics: Asking for prices, ordering food, and making simple requests
- Listening: Store and restaurant dialogues
- Speaking: Role-playing customer interactions in shops and restaurants
- Cultural Focus: Japanese dining etiquette and manners

Unit 3 | **Technology and Digital Communication in Japanese** | **09 hours**

- Topics: Messaging apps, writing short emails

- Listening: Voice message comprehension, instructions in Japanese
- Speaking: Simulating phone conversations and digital communication
- Cultural Focus: Technology use in Japan and its impact on communication

Unit 4	**Respecting Japanese and Indian Cultures in Global Context**	**09 hours**

- Topics: Japanese traditions, festivals, family structures, Japanese language in international business and cultural exchange
- Listening: Japanese discussions on family and holidays
- Cultural Comparison: Japanese vs. Indian family values, hierarchical structures

Total Lecture Hours	**30 hours**

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**-**	**100**

Theory Course Code: K24ASH02P	**Theory Course Name: Basic Proficiency in German**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. To Develop basic listening, speaking, reading and writing proficiency in the target language, enabling global communication skills.
2. To Foster an understanding of intercultural communication, particularly between Indian and target-language-speaking cultures.
3. Introduce students to the global significance of the target language and appreciate its culture & ethics in international contexts.

Course Outcome: After completion of the course, the student will be able to

1. Understand how language and culture interact in global context and impact intercultural communication
2. Introduce themselves in the respective language and understand the syllables and number
3. Apply their learning in basic conversations and understand the social etiquette of professional world
4. Utilize the skills of listening, speaking and non-verbal communication in the target language

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	1	3	-	1
CO2	-	-	-	-	-	-	-	-	1	3	-	1
CO3	-	-	-	-	-	-	-	-	1	3	-	1
CO4	-	-	-	-	-	-	-	-	1	3	-	1
CO5	-	-	-	-	-	-	-	-	1	3	-	1

Unit 1	**Basic Component of German**	**09 hours**

- Express and understand basic greetings
- Say his/her name and ask others
- Ask, answer and understand questions on nationality
- Identify, say and understand numbers from 1-20
- Orally present oneself briefly. (using simple adjectives)
- Recognize and spell correctly alphabet in German.
- Understand and use basic classroom instructions.

Unit 2	**Navigating Everyday Situations**	**09 hours**

- Topics: Asking for directions, shopping
- Listening: Conversations in stores, public transport
- Speaking: Role-playing travel and shopping scenarios
- Cultural Focus: Understanding German customer service and politeness

Unit 3	**Digital and Non-verbal Communication in German**	**09 hours**

- Topics: Writing formal/informal emails, texts
- Listening: Voice messages, email instructions

- Speaking: Practicing phone calls and messages
- Cultural Focus: Differences in professional communication styles in Germany

Unit 4	**Respecting German and Indian Cultures in Global Context**	**09 hours**

- Topics: Work culture, family values, and celebrations, German language in international business and tourism
- Listening: German perspectives on holidays and family life
- Cultural Comparison: Indian vs. German approaches to work-life balance

	Total Lecture Hours	**30 hours**

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**-**	**100**

Theory Course Code: K24ASH03P	**Theory Course Name: Basic Proficiency in French**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. To Develop basic listening, speaking, reading and writing proficiency in the target language, enabling global communication skills.
2. To Foster an understanding of intercultural communication, particularly between Indian and target-language-speaking cultures.
3. Introduce students to the global significance of the target language and appreciate its culture & ethics in international contexts.

Course Outcome: After completion of the course, the student will be able to

1. Understand how language and culture interact in global context and impact intercultural communication
2. Introduce themselves in the respective language and understand the syllables and number
3. Apply their learning in basic conversations and understand the social etiquette of professional world
4. Utilize the skills of listening, speaking and non-verbal communication in the target language

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	1	3	-	1
CO2	-	-	-	-	-	-	-	-	1	3	-	1
CO3	-	-	-	-	-	-	-	-	1	3	-	1
CO4	-	-	-	-	-	-	-	-	1	3	-	1
CO5	-	-	-	-	-	-	-	-	1	3	-	1

Unit 1	**Basic Component of French Language**	**09 hours**

- Express and understand basic greetings
- Say his/her name and ask others
- Ask, answer and understand questions on nationality
- Identify, say and understand numbers from 1-20
- Orally present oneself briefly. (using simple adjectives)
- Recognize and spell correctly alphabet in French
- Understand and use basic classroom instructions.

Unit 2	**Basic Communication and Social Etiquette**	**09 hours**

- Topics: Greetings, introductions, simple conversations, Identify, say and understand numbers from 21-50
- Listening Activities: Audio recordings of daily conversations (e.g., asking directions)
- Speaking Practice: Role-playing everyday scenarios (e.g., at a café, meeting new people)
- Cultural Focus: French social etiquette, mealtime behavior

Unit 3	**Expressing Needs and Asking Questions**	**09 hours**

- Topics: Asking for help, making requests, and inquiries, Identify, say and understand numbers from 51-100
- Listening: Simple dialogues (e.g., ordering food, asking for information)
- Speaking: Formulating questions and responses

- Cultural Focus: Formal vs. informal communication in France

Unit 4	**Respecting French and Indian Cultures in Global Context**	**09 hours**

- Topics: Understanding French family values, traditions, and how they differ from Indian values, French language in international diplomacy, travel, and business
- Activities: Discussions on holidays, family dynamics, and festivals
- Comparison: French cuisine vs. Indian cuisine, cultural symbolism

Total Lecture Hours	**30 hours**

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**-**	**100**

Theory Course Code: K24ASH04P	**Theory Course Name: Basic Proficiency in Spanish**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. To Develop basic listening, speaking, reading and writing proficiency in the target language, enabling global communication skills.
2. To Foster an understanding of intercultural communication, particularly between Indian and target-language-speaking cultures.
3. Introduce students to the global significance of the target language and appreciate its culture & ethics in international contexts.

Course Outcome: After completion of the course, the student will be able to

1. Understand how language and culture interact in global context and impact intercultural communication
2. Introduce themselves in the respective language and understand the syllables and number
3. Apply their learning in basic conversations and understand the social etiquette of professional world
4. Utilize the skills of listening, speaking and non-verbal communication in the target language

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	1	3	-	1
CO2	-	-	-	-	-	-	-	-	1	3	-	1
CO3	-	-	-	-	-	-	-	-	1	3	-	1
CO4	-	-	-	-	-	-	-	-	1	3	-	1
CO5	-	-	-	-	-	-	-	-	1	3	-	1

Unit 1	**Basic Component of Spanish**	**09 hours**

- Express and understand basic greetings
- Say his/her name and ask others
- Ask, answer and understand questions on nationality
- Identify, say and understand numbers from 1-20
- Orally present oneself briefly. (using simple adjectives)
- Recognize and spell correctly alphabet in Spanish.
- Understand and use basic classroom instructions.

Unit 2	**Navigating Common Situations**	**09 hours**

- Topics: Asking for help, giving directions
- Listening: Directions, shopping dialogues
- Speaking: Role-playing travel and shopping scenarios
- Cultural Focus: Politeness in Spanish-speaking cultures, regional differences

Unit 3	**Using Technology in Spanish Communication**	**09 hours**

- Topics: Writing emails, texting, using social media
- Listening: Voice notes, social media interactions
- Speaking: Practicing digital communication in Spanish

- Cultural Focus: The use of technology in Spanish-speaking countries

Unit 4	**Respecting Spanish and Indian Cultures in Global Context**	**09 hours**

- Topics: Spanish festivals, cultural differences in communication, The importance of Spanish in global communication
- Listening: Cultural discussions, traditions in Spain
- Cultural Comparison: Spanish siesta vs. Indian work culture, family structure

	Total Lecture Hours	**30 hours**

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**-**	**100**

Theory Course Code: K24ASH11P	**Theory Course Name: Communication Skills**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**4**	**2**

Pre-requisite: NA

Course Objectives:

1. To develop the Listening skills in professional setting.
2. To acquaint students with the techniques of Reading comprehension and note making for specific information, and grammatically correct organization of ideas.
3. To help students develop their Writing skills by building their vocabulary through word formation methods and writing principles.
4. To help students apply the basics of Communication and voice dynamics for effective speech delivery.
5. To develop Professional practices of communication at workplace.

Course Outcome: After completion of the course, the student will be able to

1. Get basic understanding of language dimensions (LSRW) and Communication Skills.
2. Apply correct English usage and formal style of writing .
3. Analyze the usage of verbal and non-verbal cues in presentation and day-to-day communication.
4. Evaluate Communication skills with respect to the nature and objectives of workplace.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	-	-	-	-	-	-	-	-	-	3	-	1
CO2	-	-	-	-	-	-	-	-	-	3	-	1
CO3	-	-	-	-	-	-	-	-	-	3	-	1
CO4	-	-	-	-	-	-	-	-	-	3	-	1
CO5	-	-	-	-	-	-	-	-	-	3	-	1

List Of Activities' (Indicative & Not Limited To)

1. Ice Braking Session-Self Analysis using SWOC Activities (Identification of Individual Strength, Weakness, Opportunity and Threats/Challenges
2. Vocabulary Enhancement Activity using worksheet
3. Formal day-to-day Conversation activity on planning real time situation using past week Vocabulary.
4. Paragraph development in 100-120 words using newspaper editorials.
5. Speaking to introduce person, places and events.
6. Evaluation of Students using written and speaking activity
7. Reading Comprehension
8. Idea pitching using (Group)
9. Role play activity creating awareness on real time situation (Group)
10. Essay writing on PESTLE range of topics
11. Blog writing using PESTLE range of topics
12. Thematic presentation
13. Review of scientific article/ books/blogs/news

14. Evaluation of Students using written and speaking activity- JAM

Total Lecture Hours	**30 hours**

Mode of Evaluation

MSE		CA					ESE	Total
MSE1	MSE2	CA1	CA2	CA3	CA4 (ATT)	CA5		
40	40	5	5	5	5	5		
80		Best of 4 (20)					-	100

Theory Course Code: K24ID21P	**Theory Course Name: Innovation and Entrepreneurship**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**1**

Pre-requisite: NA

Course Objectives:

1. To cultivate an innovative mindset among students by introducing them to various types of innovation, success stories, and the importance of creativity in problem-solving and entrepreneurship.
2. To equip students with practical tools for idea generation and commercialization by teaching them techniques for brainstorming, creativity, and developing structured business models using the Business Model Canvas.
3. To enhance students' understanding of market dynamics by providing them with skills to conduct market research, understand customer segmentation, and validate the feasibility of their business ideas through data-driven insights.
4. To foster hands-on learning through prototype development workshops where students can transform their innovative ideas into minimum viable products (MVP) and prepare for investor pitching.
5. To provide real-world pitching experience by organizing Demo Day presentations where students can pitch their ideas to industry experts and investors, receive feedback, and explore potential opportunities for funding or mentorship.

Course Outcome: After completion of the course, the student will be able to

1. Students will be able to demonstrate an understanding of the various types of innovation, their importance in personal and professional growth, and how to apply innovative thinking to solve real-world problems.
2. Students will gain the ability to generate and refine innovative ideas through creative techniques and utilize the Business Model Canvas to structure viable business concepts.
3. Students will develop the skills to conduct comprehensive market research, identify and segment target customers, and validate their business ideas based on market insights and data analysis.
4. Students will be capable of transforming their innovative ideas into tangible prototypes (Minimum Viable Products) and will acquire the ability to craft and deliver compelling pitches for potential investors and stakeholders.
5. Students will be able to effectively present their business ideas to industry experts and investors, apply feedback to improve their ideas, and explore opportunities for securing funding or mentorship.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

Unit 1	**Innovation & Creativity**	**03 hours**

- Resource Person: Technical Expert/ Innovator/Entrepreneur
- Content Overview: Introduction to Innovation, the importance of Innovation in life, Type of Innovation, Stages of Innovation, success stories, and opportunities available to students.

Unit 2	**Idea/ Innovation Generation, Commercialization & Business Model Canvas Workshop**	**04 hours**

- Resource Person: Innovation Coaches/Startup Mentors
- Content Overview: Techniques for brainstorming, creativity exercises, introduction to the Business Model Canvas, and developing business concepts.

Unit 3	**Market Research and Validation Workshop**	**04 hours**

- Resource Person: Market Research Analysts/Marketing Professors
- Content Overview: Conducting market research, understanding target customers, market segmentation, and validating business ideas.

Unit 4	**Prototype Development & Pitching Workshop**	**04 hours**

- Resource Person: Product Developers/Venture Capitalists
- Content Overview: Creating a minimum viable product (MVP), hands-on prototyping, crafting, and delivering a compelling pitch.

	Total Lecture Hours	**15 hours**

Mode of Evaluation

MSE		**CA**					**ESE**	**Total**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3**	**CA4 (ATT)**	**CA5**		
40	**40**	**5**	**5**	**5**	**5**	**5**		
80		**Best of 4 (20)**					**-**	**100**

Theory Course Code: K24IDXXP	**Theory Course Name: Self-Growth/ Indian Knowledge System**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSIT/CSE(AI)/CSE(AIML)/ECE/EEE/ELCE/ME		**0**	**0**	**2**	**NC**

Self-Growth: Students need to choose any one from the Courses offered

1. Piano (K24ID01P)
2. Tabla (K24ID02P)
3. Guitar (K24ID03P)
4. Drums (K24ID04P)
5. Vocals (Classical) (K24ID05P)
6. Vocals (Western) (K24ID06P)
7. Harmonium (K24ID07P)
8. Rap (K24ID08P)
9. Beatboxing (K24ID09P)
10. Acting (K24ID10P)
11. Script Writing (K24ID11P)
12. Makeup And Props (K24ID12P)
13. Classical Dance (K24ID13P)
14. Folk Dance (K24ID14P)
15. Western Dance (K24ID15P)
16. Bollywood Dance (K24ID16P)
17. Cinematography (K24ID17P)
18. Sound Production (K24ID18P)
19. Photography & Photo Editing (K24ID19P)
20. Graphic Designing (K24ID20P)
21. Social Service (K24ID21P)
22. Painting (K24ID22P)
23. Poetry (Hindi) (K24ID23P)
24. Shooting (K24ID24P)
25. Table Tennis (K24ID25P)
26. Billiards (Pool) (K24ID26P)
27. Badminton (K24ID27P)
28. Lawn Tennis (K24ID28P)
29. Cricket (K24ID29P)
30. Basketball (K24ID30P)
31. Kabaddi (K24ID31P)
32. Volleyball (K24ID32P)
33. Football (K24ID33P)
34. Athletics (K24ID34P)

35. Karate (K24ID35P)
36. Power Yoga (K24ID36P)

Indian Knowledge System: Students need to choose any one from the Courses offered

1. Case Study of Indian water storage system (K24ID37P)
2. Case study of Indian urban planning (Indus valley civilization) (K24ID38P)
3. Learning of Geeta for Engineers (K24ID39P)
4. Vasudhaiva kutumbakam: Indian model of multiculturalism (K24ID40P)
5. Basic treatments through yoga (K24ID41P)
6. Review socialism in light of Ramayana (critical thinking) (K24ID42P)
7. The relevance and applicability of Chanakya's (Kautilya) Arthaśāstra for solving current societal problems (K24ID43P)
8. Corporate Social Responsibility: A Philosophical Social Engineering approach from an ancient Indian Perspective. (K24ID44P)
9. Lessons of leadership from Mahabharat (K24ID45P)
10. Case study of Jantar Mantar in Delhi. (K24ID46P)
11. Study of Ancient Indians technology for extraction, purification, and alloying of metals such as gold, silver, copper, and iron. (K24ID47P)
12. Study of herbs used in kitchen for healthy life (Haldi, Garlic etc.) (K24ID48P)
13. Study of Indian Astro log system (K24ID49P)
14. Study Significance of the Asanas, Pranayams and Surya Namaskar (K24ID50P)
15. Study of Indian Ragas in music (K24ID51P)
16. Study of Vaastu Shastra (K24ID52P)
17. Study of Importance of gum bads in ancient structure of India (K24ID53P)
18. Study of Ayurveda (K24ID54P)
19. Impact of Satvik Food on the Gut-Microbiome Diversity (K24ID55P)
20. Orientation of temples of South India and their astronomical associations(K24ID56P)