KANNUR UNIVERSITY

Four Year Undergraduate Programme

ELECTRONICS

Salient features of the Programme

- **Specializations:** Embedded System, Advanced Python programming, Wireless Communication, Photonics, Signal & Image Processing and VLSI
- Courses on IoT & Machine learning
- Attractive Multi-Disciplinary courses to cater the needs of students from Arts, Sciecne and Commerce disciplines

(OBE – Outcome Based Education)

2024 Admission onwards

(Semester I & II Only)

Contents

PREFACE

The Four year UG Electronics syllabus is based on Outcome Based Education (OBE) system. The Programme Specific outcomes and course outcomes are stated clearly in the syllabus. Faculty members are requested to plan their courses to achieve these outcomes at the end of each semester. The syllabus is designed with a view to cater the present day requirements of Electronics industry, R&D field, higher studies and entrepreneurship. The BoS has taken extreme care to include latest developments in Electronics. Several elective courses are included in core courses. Hence students can successfully complete this programme with specialization is frontier areas of Electronics.

The Multidisciplinary courses are also designed with an aim to attract students from Science, Arts and Commerce disciplines. These courses are highly useful for their field of study and in daily life.

The faculty members are requested to seriously involve in fourth year Project activity and work with students to come up with results that can be published in reputed journals and conference proceedings. For more details of the programme please read Kannur University regulations and curriculum framework-2024.

Majority of syllabus preparation work has been completed with the help of Adhoc committee members. The BoS take this opportunity to acknowledge their great effort inthis regard. The BoS take this opportunity to acknowledge the external resource person Dr. Sajesh Kumar U, Associate Professor, Department of Electronics & Communication Engineering, Government Engineering College, Kannur for his deep involvement in designing this programme.

BoS Electronics

Program Outcomes (POs)

Program Outcomes (POs) serve as a foundational framework defining the skills, knowledge, and attributes that students at Kannur University are expected to acquire upon completion of a specific academic program. Tailored to the unique goals of each program, POs articulate the overarching learning objectives that guide curriculum design and assessment. These outcomes encompass a diverse range of competencies, including critical thinking, problem-solving, effective communication, and discipline-specific expertise. POs play a crucial role in shaping educational experiences, ensuring alignment with academic standards and industry expectations. By articulating clear and measurable expectations, POs contribute to the continuous improvement of academic programs and provide a roadmap for students to develop into well-rounded, competent professionals within their chosen fields.

PO1: Critical Thinking and Problem-Solving-Apply critical thinking skills to analyze information and develop effective problem-solving strategies for tackling complex challenges.

PO2: Effective Communication and Social Interaction-Proficiently express ideas and engage in collaborative practices, fostering effective interpersonal connections.

PO3: Holistic Understanding-Demonstrate a multidisciplinary approach by integrating knowledge across various domains for a comprehensive understanding of complex issues.

PO4: Citizenship and Leadership-Exhibit a sense of responsibility, actively contribute to the community, and showcase leadership qualities to shape a just and inclusive society.

PO5: Global Perspective-Develop a broad awareness of global issues and an understanding of diverse perspectives, preparing for active participation in a globalized world.

PO6: Ethics, Integrity and Environmental Sustainability-Uphold high ethical standards in academic and professional endeavors, demonstrating integrity and ethical decision-making. Also acquire an understanding of environmental issues and sustainable practices, promoting responsibility towards ecological well-being.

PO7: Lifelong Learning and Adaptability-Cultivate a commitment to continuous self directed learning, adapting to evolving challenges, and acquiring knowledge throughout life.

Programme Specific Outcomes (PSOs) of FYUGP-Electronics Programme

After the completion of this programme, the students will be able to:

PSO1: Apply knowledge of electronics principles in solving real world problems

PSO2: Design and conduct electronics experiments and to analyze and interpret data

PSO3: Identify, formulate, solve and analyze the problems in various disciplines of electronics.

PSO4: Design and manage electronic systems or processes that conforms to a given specification

PSO5: Develop low level and high level programming to cater the needs of electronics industry

PSO6: Utilize techniques, skills and modern technological/scientific/ engineering software/tools for professional practices

PSO7: Function as a member of a multidisciplinary team through projects, internships etc.

COURSE AND CREDIT DISTRIBUTION FOR DIFFERENT PATHWAYS

Course Distribution for Students in Semesters I – VI

(1) ***Single Major***: The 6 courses together in B and C can be in different disciplines.

(2) ***Major with Multiple Disciplines***: B and C represent two different disciplines.

(3) ***Major with Minor***: B and C represent the same Minor discipline.

(4) ***Major with Vocational Minor***: B and C represent the same Vocational Minor discipline

Semester	**DSC (credit 4)**	**AEC (credit 3)**	**SEC (credit 3)**	**MDC (credit 3)**	**VAC (credit 3)**	**Total Courses**	**Total Credits**
I	A1, B1, C1	AEC1 (E) AEC2 (AL)		MDC1		6	21
II	A2, B2, C2	AEC3 (E) AEC4 (AL)		MDC2		6	21
III	A3, A4, B3, C3			MDC3 (KS)	VAC1	6	22
IV	A5, A6, A7		SEC1		VAC2, VAC3	6	21
V	A8, A9, A10, A11*, A12* (*DSE)		SEC2			6	23
VI	A13, A14, A15, A16*, A17* (*DSE)		SEC3			6	23
	INTERNSHIP						2
Total	Major A : 17 Other Disciplines (B &C): 6	4	3	3	3	36	133

Double major pathway: A and B represent the courses offered by the two departments. Students should choose one of the disciplines as their major 1 and the other as major 2

Semester	**DSC (credit 4)**	**AEC (credit 3)**	**SEC (credit 3)**	**MDC (credit 3)**	**VAC (credit 3)**	**Total Courses**	**Total Credits**
I	3 A1, A2, B1	AEC1 (E) AEC2 (AL)		A/B		6	21
II	3 A3, B2, B3	AEC3(E) AEC4 (AL)		A/B		6	21
III	4 A4, A5, B4, B5			A/B	A/B	6	22
IV	4 A6, A7, B6		A/B		A/B A/B	6	21
V	5 A8, A9, A10*, B7, B8* (*DSE)		A/B			6	23
VI	5 A11, A12*, B9, B10, B11* (*DSE)		A/B			6	23
	INTERNSHIP						2
Total (for departments)	Major A : 12 Major B : 11	4	A: 2, B:1	A:2 B:1	A:2 B:1	A:18 B:14 AEC:4	
EXIT WITH UG DEGREE / PROCEED TO FOURTH YEAR WITH MINIMUM 133 CREDITS On completion of 3-year UG Student will get 68 credits in major A (48 + 18+2 = 68 (50% of 133)) and 53 credits in Major B (44 + 9 = 53 (40% of 133))							

COURSE DISTRIBUTION FOR STUDENTS IN THE FOURTH YEAR

SEME-STER	DSC (credit 4)	Nature of the Course	Total Courses	Total Credits	Total Hrs/ Week
VII	Major A, A, A, A, A	Five PG level core courses (level 400 & above) in the Major discipline	5	20	20
VIII	Major A, A, A or Project in A	(i) Three PG level core courses (level 400 & above) in the Major discipline (for Honours); or (ii) Combination of Major core courses of level 400 & project up to 12 credits in the Major discipline (for Honours); or (iii) One 12-credit Research Project in the Major discipline (for Honours with Research) (iv) In the case of Honours students who go to another institution for doing the Project, the remaining Major core course can be in the online mode or in the in-person mode from the institution where the Project is being done.	3	12	12
	Major A*, A*, A* (*Electives 5, 6, 7) or Minor in any discipline	(i) Three Minor Pathway Courses of level 300 & above / level 400 & above; or (ii) Three Elective Courses in Major discipline of level 400 & above; or (iii) Two courses in Minor discipline + One course in Major / any other discipline; or (iv) Three Courses in any other discipline of level 300 & above / level 400 & above; or	3	12	12

	B, B, B or Any three disciplines	(v) Two courses in Major / Minor / any other discipline + One course in research methodology (vi) Two of these courses can be in the online mode. These online courses can be taken either in semester VII or in semester VIII, but their credits shall be added to the student's account only in semester VIII. (vii) For those students who go to another institution for doing the Project, all these three courses can be in the online mode or in the in-person mode from the institution where the Project is being done.			
Total of VII & VIII			11		44
Exit with UG Honours Degree with 177 Credits					

Note: For more details please refer 'Kannur University FYUGP – Regulations and Curriculum Framework – 2024' available in Kannur university website

List of Courses (Category wise)

Discipline Specific Core Courses (DSC) - Major pathway

Sl. No.	Semester	Course Code	Course Title	MARKS			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	1	KU1DSCELE101	Fundamentals of Electrical and Electronics	30	70	100	3	0	1	4	3	0	2	5
2	2	KU2DSCELE105	Fundamentals of Digital Circuits	30	70	100	3	0	1	4	3	0	2	5
3	3	KU3DSCELE201	Analog Electronics	30	70	100	3	0	1	4	3	0	2	5
4	3	KU3DSCELE205	Microprocessor and microcontroller	30	70	100	3	0	1	4	3	0	2	5
5	4	KU4DSCELE206	Analog Integrated Circuits	30	70	100	3	0	1	4	3	0	2	5
6	4	KU4DSCELE207	Electronic Communication	30	70	100	3	0	1	4	3	0	2	5
7	4	KU4DSCELE208	Electronic Intstrumentation	30	70	100	3	0	1	4	3	0	2	5
8	5	KU5DSCELE301	Fibre optic communication	30	70	100	4	0	0	4	4	0	0	4
9	5	KU5DSCELE302	Digital System Design	30	70	100	3	0	1	4	3	0	2	5
10	5	KU5DSCELE303	Embedded Systems	30	70	100	3	0	1	4	3	0	2	5
11	5		Elective1											
12	5		Elective2											
13	6	KU6DSCELE304	Python Programming	30	70	100	3	0	1	4	3	0	2	5

14	6	KU6DSCELE305	VLSI	30	70	100	4	0	0	4	4	0	0	4
15	6	KU6DSCELE306	ARM Processor	30	70	100	3	0	1	4	3	0	2	5
16	6	KU6INTELE200	**Intership**							2				
17	6		Elective3											
18	6		Elective4											
19	7	KU7DSCELE401	Low power VLSI	30	70	100	3	0	1	4	3	0	2	5
20	7	KU7DSCELE402	Information Theory and coding	30	70	100	3	0	1	4	3	0	2	5
21	7	KU7DSCELE403	Machine Learning	30	70	100	3	0	1	4	3	0	2	5
22	7	KU7DSCELE404	Printed Antennas	30	70	100	3	0	1	4	3	0	2	5
23	7	KU7DSCELE405	Digital Image processing	30	70	100	3	0	1	4	3	0	2	5
Honours with Research														
24	8	KU8RPHELE400	PROJECT							12				
25	8		Elective5*											
26	8		Elective6*											
27	8		Elective7*											
Honours without research														
28	8	KU8DSCELE406	Embedded OS and RTOS	30	70	100	3	0	1	4	3	0	2	5
29	8	KU8DSCELE407	Advanced Python Programming	30	70	100	3	0	1	4	3	0	2	5
30	8	KU8DSCELE408	Deep learning	30	70	100	3	0	1	4	3	0	2	5
31	8		Elective5											
32	8		Elective6											
33	8		Elective7											

*** These electives can be done as online courses. BoS will decide the title of the online courses upon request from the insitution.**

Discipline Specific Core Courses (DSC) - Minor Pathway

Sl. No.	Semester	Course Code	Course Title	MARKS			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	1	KU1DSCELE102	Fundamentals of Digital Electronics	30	70	100	3	0	1	4	3	0	2	5
2	1	KU1DSCELE103	Basic Electronics	30	70	100	3	0	1	4	3	0	2	5
3	1	KU1DSCELE104	Foundations of Electrical and Electronics	30	70	100	3	0	1	4	3	0	2	5
4	2	KU2DSCELE106	Introduction to 8051 Microcontroller	30	70	100	3	0	1	4	3	0	2	5
5	2	KU2DSCELE107	Electronic Devices and Circuits	30	70	100	3	0	1	4	3	0	2	5
6	2	KU2DSCELE108	Digital Electronics	30	70	100	3	0	1	4	3	0	2	5
7	3	KU3DSCELE202	Embedded C and Arduino programming	30	70	100	3	0	1	4	3	0	2	5
8	3	KU3DSCELE203	Linear Integrated Circuits	30	70	100	3	0	1	4	3	0	2	5
9	3	KU3DSCELE204	Analog Circuits	30	70	100	3	0	1	4	3	0	2	5

Discipline Specific Elective Courses (DSE) – Major Pathway

Sl. No.	Semester	Course Code	Course Title	Marks			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	5	KU5DSEELE307	Programming with C	30	70	100	4	0	0	4	4	0	0	4
2	5	KU5DSEELE308	Signals and Systems	30	70	100	4	0	0	4	4	0	0	4
3	5	KU5DSEELE309	PIC microcontrollers	30	70	100	4	0	0	4	4	0	0	4
4	5	KU5DSEELE310	Electromagnetics	30	70	100	4	0	0	4	4	0	0	4
5	5	KU5DSEELE311	Power Electronics	30	70	100	4	0	0	4	4	0	0	4
6	5	KU5DSEELE312	Control System	30	70	100	4	0	0	4	4	0	0	4
7	5	KU5DSEELE313	Wireless sensor Networks	30	70	100	4	0	0	4	4	0	0	4
8	6	KU6DSEELE314	Fundamentals of IOT	30	70	100	4	0	0	4	4	0	0	4
9	6	KU6DSEELE315	Robotics and Automation	30	70	100	4	0	0	4	4	0	0	4
10	6	KU6DSEELE316	Wireless Communications	30	70	100	4	0	0	4	4	0	0	4
11	6	KU6DSEELE317	Digital Signal Processing	30	70	100	4	0	0	4	4	0	0	4
12	6	KU6DSEELE318	Advanced Power electronics	30	70	100	4	0	0	4	4	0	0	4
13	6	KU6DSEELE319	Antennas and Microwave Devices	30	70	100	4	0	0	4	4	0	0	4
14	6	KU6DSEELE320	MEMS	30	70	100	4	0	0	4	4	0	0	4
15	6	KU6DSEELE321	Cryptography	30	70	100	4	0	0	4	4	0	0	4
16	8	KU8DSEELE409	Research Methodology	30	70	100	4	0	0	4	4	0	0	4
17	8	KU8DSEELE410	Computer	30	70	100	4	0	0	4	4	0	0	4

			networks											
18	8	KU8DSEELE411	Microwave Integrated Circuits	30	70	100	4	0	0	4	4	0	0	4
19	8	KU8DSEELE412	Radar and navigation	30	70	100	4	0	0	4	4	0	0	4
20	8	KU8DSEELE413	Industrial Automation	30	70	100	4	0	0	4	4	0	0	4
21	8	KU8DSEELE414	Optical sensing	30	70	100	4	0	0	4	4	0	0	4
22	8	KU8DSEELE415	Mixed Signal Circuit Design	30	70	100	4	0	0	4	4	0	0	4
23	8	KU8DSEELE416	Secure Communication	30	70	100	4	0	0	4	4	0	0	4
24	8	KU8DSCELE417	Basic Tools of Microwave Engineering	30	70	100	4	0	0	4	4	0	0	4

Discipline Specific Elective Courses (DSE) – Minor Pathway

1	8	KU8DSEELE322	Embedded OS and RTOS	30	70	100	4	0	0	4	4	0	0	4
2	8	KU8DSEELE323	Advanced Python Programming	30	70	100	4	0	0	4	4	0	0	4
3	8	KU8DSEELE324	VLSI	30	70	100	4	0	0	4	4	0	0	4
4	8	KU8DSEELE325	Fundamentals of IOT	30	70	100	4	0	0	4	4	0	0	4

Skill Enhancement Courses (SEC)

Sl. No.	Semester	Course Code	Course Title	Marks			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	4	KU4SECELE109	Embedded product design	25	50	75	2	0	1	3	2	0	2	4
2	5	KU5SECELE110	Computer Aided Circuit design	25	50	75	3	0	0	3	3	0	0	3
3	6	KU6SECELE111	PCB Design and Fabrication	25	50	75	3	0	0	3	3	0	0	3

Value Added Courses (VAC)

Sl. No.	Semester	Course Code	Course Title	Marks			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	3	KU3VACELE112	Web Application Development	25	50	75	3	0	0	3	3	0	0	3
2	4	KU4VACELE113	Mobile Application development	25	50	75	3	0	0	3	3	0	0	3
3	4	KU4VACELE114	Artificial Intelligence for You	25	50	75	3	0	0	3	3	0	0	3

Multi Disciplinary Courses (MDC)

Sl.No.	Semester	Course Code	Course Title	Marks			Credit				Hours/Week			
				CE	ESE	Total	L	T	P	Total	L*	T*	P*	Total
1	1	KU1MDCELE001	Computer Hardware	25	50	75	2	0	1	3	2	0	2	4
2		KU1MDCELE002	Electronics for You	25	50	75	2	0	1	3	2	0	2	4
3	2	KU2MDCELE003	R and Python for Data Analysis	25	50	75	2	0	1	3	2	0	2	4
4	3	KU3MDCELE004	Fundamentals of Electric Vehicles	25	50	75	3	0	0	3	3	0	0	3

* L=Lecture, T=Tutorial, P=Practical

Internship & Project

Sl.No.	Semester	Course Code	Course Title	Credit
1	6	KU6INTELE200	INTERNSHIP	2
2	8	KU8RPHELE400	PROJECT	12

SYLLABUS

Semester -I

Sl.No.	Course Type	Course Title	Course Code	Credit
1	Major	Fundamentals of Electrical and Electronics	KU1DSCELE101	4
2	Minor	Fundamentals of Digital electronics	KU1DSCELE102	4
		Basic Electronics	KU1DSCELE103	4
		Foundations of Electrical and Electronics	KU1DSCELE104	4
3	Multi Disciplinary Course (MDC)	Computer Hardware	KU1MDCELE001	3
		Electronics for You	KU1MDCELE002	3

KU1DSCELE101: Fundamentals of Electrical and Electronics

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	Major	100	KU1DSCELE101	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This is a comprehensive introductory course designed to provide a solid understanding of the basic principles and concepts underlying electrical and electronics engineering. Topics covered include basic circuit theories, Resistor, Inductor and Capacitor (RLC)circuits, semiconductor devices like PN Junction Diode,Zener diode, BJT and MOSFET, and Regulated rectifiers. Throughout the course, emphasis is placed on practical applications to reinforce theoretical concepts. By the end of the course, students should have a solid foundation in electrical and electronics engineering principles, preparing them for more advanced coursework or practical applications in the field.

Course Prerequisite: Basic understanding of algebra and trigonometry. Familiarity with basic physics concepts

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Apply basic circuit theories to analyse and solve simple electrical circuits.	A
2	Understand the analysis of RLC circuits.	E
3	Explain the operation principles of semiconductor devices	U

4	Design and analyse regulated rectifier circuits	C
5	Develop practical experience through laboratory experiments and projects	C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						
CO 2							
CO 3							
CO 4	3	3					
CO 5		3					3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
	Module I		**10**
1	1.1	Voltage and Current dividers, Kirchhoff's current Law and voltage law (KCL, KVL)	
	1.2	Mesh & Node analysis (DC analysis)	
	1.3	Thevenin's theorem and Norton's theorem	
	1.4	Superposition theorem and Maximum power transfer theorem	
2	**Module II**		**10**
	2.1	Capacitor - charging and discharging , parallel and series C, AC through C, impedance, X_C,	

	2.2	Inductor – Self and mutual inductance, transformers, X_L, impedance	
	2.3	Concept of L/R and RC time constant, wave shapes, long and short time constants	
	2.4	Concept of filter- RC filters – low pass and high pass, decibel and frequency response curve	

3	**Module III**		**10**
	3.1	Semiconductors, PN junction, depletion layer, Barrier potential, biasing , reverse break down, depletion layer capacitance, PN junction diode, V-I characteristics	
	3.2	Zener diode, Break down mechanisms, V-I characteristics	
	3.3	Rectifiers – Halfwave, fulwave (center tapped and bridge), Filters	
	3.4	Zener diode Regulators	

4	**Module IV**		**10**
	4.1	BJT , contruction, operation and characteristics	
	4.2	MOSFET contruction, operation and characteristics	
	4.3	BJT biaisng (Fixed , emitter and voltage divider)	
	4.4	BJT and MOSFET as switch	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

1. Grob's Basic Electronics: Mitchel E Schultz, Tata McGraw Hill Education , 10thEdition

2. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

Suggested Readings:

1. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition
2. A text book of Electrical Technology: B.L.Theraja, S.Chand and Co.
3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH
4. Electronic Devices and Circuits: Bolyestad, TataMcGraw Hill.
5. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition.
6. Circuits and Networks- Analysis and Synthesis: Sudhakar A and Shyammohan S Palli, McGraw Hill Education (India) Pvt Ltd , 5 th Edition

Laboratory Sessions : Practical sessions to reinforce theoretical concepts

1 : Familiarization of components, Multimeter, CRO and function generator

Objective: To introduce students to essential electronic components and measurement instruments.

Tasks:

Identify and understand the function of common electronic components such as resistors, capacitors, diodes, and transistors.

Learn to use a multimeter for measuring voltage, current, and resistance.

Familiarize with the operation of a Cathode Ray Oscilloscope (CRO) for visualizing and measuring signals.

Understand the function and operation of a function generator for generating different types of waveforms.

2 :Soldering practice

Objective: To develop basic soldering skills for electronic assembly and repair.

Tasks:

Learn soldering safety practices and procedures. Practice soldering wires, through-hole components, and surface-mount components on a soldering board.

Understand proper soldering techniques including tinning, solder joint formation, and desoldering.

3: Implement resistive network and verify network theorems: Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL)

Objective: To understand and apply Kirchhoff's laws to analyze resistive networks.

Tasks:

Construct a resistive network using resistors of different values.

Measure currents at various nodes to verify Kirchhoff's Current Law (KCL).

Measure voltages around closed loops to verify Kirchhoff's Voltage Law (KVL).

Compare measured values with theoretical predictions and assess the accuracy of the laws.

4: Implement a Half wave rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To understand the operation of a half-wave rectifier and its ripple reduction using a capacitive filter.

Tasks:

Build a half-wave rectifier circuit using a diode and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Add a capacitive filter to the circuit and measure the ripple voltage reduction.

Calculate and compare ripple factors with and without the capacitive filter.

5: Implement a Full wave centre tapped rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To study the operation of a full-wave center-tapped rectifier and its ripple reduction techniques.

Tasks:

Construct a full-wave center-tapped rectifier using diodes and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Add a capacitive filter to the circuit and measure the ripple voltage reduction.

Calculate and compare ripple factors with and without the capacitive filter.

6 : Implement a Full wave bridge rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To investigate the operation of a full-wave bridge rectifier and its ripple reduction methods.

Tasks:

Build a full-wave bridge rectifier circuit using diodes and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Integrate a capacitive filter into the circuit and measure the resulting ripple voltage reduction.

Determine and compare ripple factors with and without the capacitive filter.

7: Implement a Zener diode voltage regulator and study Line regulation and Load regulation

Objective: To understand the operation of a Zener diode voltage regulator and its regulation characteristics.

Tasks: Construct a Zener diode voltage regulator circuit with a load resistor.

Vary the input voltage and measure the output voltage to study line regulation.

Change the load resistance and measure the output voltage to study load regulation.

Analyze the stability and performance of the voltage regulator under different conditions.

8:Design and Implement a Voltage divider Biased BJT circuit and verify Q point

Objective: To design and analyze a voltage-divider biased BJT circuit and verify its operating point

Tasks:

Design a voltage-divider bias circuit using resistors and a bipolar junction transistor.

Calculate the operating point (Q point) of the transistor using DC biasing equations.

Construct the circuit and measure DC voltages and currents to verify the Q point.

Compare measured values with calculated values and assess the stability of the Q point.

9: Design and implement a fixed bias BJT circuit and study variation of Q point with temperature

Objective: To investigate the effects of temperature on the operating point of a fixed bias BJT circuit.

Tasks:

Design a fixed bias BJT circuit using resistors for biasing.

Construct the circuit and measure DC voltages and currents at room temperature.

Heat the transistor using a heat source and observe changes in the Q point.

Measure DC voltages and currents at elevated temperatures and analyze the variation in the operating point.

10:Design a regulated power supply and drive a relay using BJT as a switch

Objective: To design and implement a regulated power supply and use a BJT as a switch to control a relay.

Tasks:

Design a regulated power supply circuit using voltage regulator ICs or discrete components.

Construct the power supply and measure the output voltage and current.

Design a relay driver circuit using a BJT as a switch.

Connect the relay to the power supply and control its operation using the BJT switch.

Verify the functionality of the relay driver circuit and assess its performance.

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
o End Semester Exam	50
o End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15

Assignments	10
Lab	5

KU1DSCELE102: Fundamentals of Digital Electronics

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	Minor	100	KU1DSCELE102	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course aims to develop knowledge about Digital Electronics. The course cover number system, logic gates, logic families, combinational circuits, Flip flops, shift registers and counters. Practical sessions are also included in this course.

Course Prerequisite: Basic understanding of Electronics at higher secodary level

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain different number systems	U
2	Apply Boolean algebra rules and Karnaugh map	A
3	Compare Logic families	U
4	Develop combinational and sequential circuits	C
5	Design and develop digital circuit and systems	C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create ©***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2	2	3	2	3			
CO 3	3	2		2			
CO 4	3	3	3	3			
CO 5	3	3	2	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Module I**		**10**
	1.1	Number systems – Decimal, Binary, Octal & Hexadecimal	
	1.2	Conversions, Digital codes – BCD, Excess 3, Gray code	
	1.3	Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table	
	1.4	Boolean algebra & theorems, De Morgan's theorem, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).	
2	**Module II**		**10**
	2.1	Different Logic families: TTL, CMOS, ECL & its characteristics.	
	2.2	Combinational circuits: Adders - Half adder and Full adder. Subtractors - Half and Full Subtractor.	
	2.3	Comparators - 1 bit magnitude & 2 bit magnitude. Decoders - 2 to 4 &	

		3 to 8.	
	2.4	Encoders – Octal to Binary & Decimal to BCD, Code converters - Gray to Binary, Binary to Gray and Binary to BCD.	

3	**Module III**		**10**
	3.1	Multiplexers: 2 input, 4 input & 8 input.	
	3.2	Demultiplexers: 1 to 4 & 1 to 8.	
	3.3	Realization of Boolean expression using multiplexers and demultiplexers.	
	3.4	Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T and Master slave	

4	**Module IV**		**10**
	4.1	Counters: Ripple Binary counter, up counter, down counter, concept of modulus counters, Decade counter	
	4.2	Shift registers: SISO, SIPO, PISO, PIPO shift registers	
	4.3	Ring counter, Johnsons counter	
	4.4	Design for random sequence generator	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

1. Thomas L Floyd, Digital Fundamentals, Pearson, 2011.

2. Anandkumar, Fundamentals of digital circuits, PHI, 2012.

Suggested Readings:

1. John MYarbrough, Digital logic- Application and Design, Thomson Learning,2006.

2. John Wakerly, Digital Design Principles and Practice, Pearson,4/e, 2012.

3. Morris Mano,Ciletti, Digital Design, 4/e, Pearson ,4/e, 2009

4. Thomas A.DeMessa, Zack Ciecone: Digital Integrated Ciruits, Wiley India,2007

5. Ghoshal, Digital Electronics, Cengage, 2012.

6. Malvino& Leach, Digital principles and applications, TMH.

LAB EXPERIMENTS

1. Realization of basic gates using NAND gate
2. Realization of basic gates using NOR gate
3. Realize Half adder
4. Realize Full adder
5. Realize Halfsubtractor
6. Realize Full Subtractor
7. Realize 2 X 1 and 4 X 1 Multiplexers using logic gates
8. Realize SR, JK and D flipflop using NAND gate
9. Setup a partity checker
10. Setup a Digital circuit for water level controller

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
7. End Semester Exam	50

8. End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15
Assignments	10
Lab	5

KU1DSCELE103: Basic Electronics

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	Minor	100	KU1DSCELE103	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course aims to develop knowledge about Basic Electronics. The course cover basic netowrk theorems, passive components, semi conductor theory, PN junction diode and its characteristics, rectifiers, filters and regulator circuit.Practical sessions are also included in this course. After the successful completion of this course the student will be able to design simple circuits.

Course Prerequisite: Basic understanding of higher secondary level Physics and mathematics

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain basic elements of electronic circuits	U
2	Solve problems using network theorems	A
3	Explain the operation of PN Junction diode	U
4	Design regulated diode rectifiers	C
5	Design and develop electronic circuits and systems	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2	2		2			
CO 2	3	3	2	3			
CO 3	2	2		2			
CO 4	3	3	2	3			
CO 5	3	3	3	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Module I**		**5**
	1.1	Resistor – different types, colour coding, power dissipation and rating	
	1.2	Current through series resistance, KVL, parallel resistance, KCL, Balanced bridge	
	1.3	DC voltage and current , Ohms law	
	1.4	Alternating Current, sine wave, peak r.m.s and average value, frequency, phase and period	
2	**Module II**		**10**
	2.1	Voltage and Current dividers, Kirchhoff's Laws (KCL, KVL)	
	2.2	Mesh & Node (DC analysis)	
	2.3	Source tranformation, Superposition theorem	
	2.4	Thevenin's theorem, Norton's theorem, Maximum power transfer	

		theorem	

3	**Module III**		**10**
	3.1	Capacitor - Different types, capacitance, charging and discharging , capacitor coding	
	3.2	Parallel and series C, energy stored, AC through C, XC, Volatge lags current, XC and R in series, XC and R parallel, impedance	
	3.3	Inductor – Self and mutual inductance, transformers, XL, Voltage leads current, phase angle, XL and R in series and parallel impedance	
	3.4	Q of a coil, Concept of L/R and RC time constant, wave shapes, long and short time constants	

4	**Module IV**		**15**
	4.1	Semiconductors – Intrinsic, extrinsic, N type, P type, Majority and minority charge carriers	
	4.2	PN junction, depletion layer, Barrier potential, biasing , reverse break down, depletion layer capacitance, PN junction diode, V-I characteristics, diode equation ,ideal and real diode	
	4.3	Zener diode , breakdown, characteristics, applications, Varactor diode, light emitting diode	
	4.4	Rectifiers (half and full wave), ripple factor, Efficiency, rectifier with capacitor-filter, Voltage regulator, Zener regulator	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected		

area/ activity

Essential Readings:

1. Grob's Basic Electronics: Mitchel E Schultz, Tata McGraw Hill Education , 10thEdition

2. Circuits and Networks- Analysis and Synthesis: Sudhakar A and Shyammohan S Palli, McGraw Hill Education (India) Pvt Ltd , 5 th Edition

3. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

Suggested Readings:

1. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition

2. A text book of Electrical Technology: B.L.Theraja, S.Chand and Co.

3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH

3. Electronic Devices and Circuits: Bolyestad, TataMcGraw Hill.

4. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition.

Laboratory Sessions : Practical sessions to reinforce theoretical concepts

LAB EXPERIMENTS

1. Familiarization of components

Resistor, Capacitor, Inductor, Diode, Transistor, Cables, Connectors, Transformer,

Switches, Fuses, Relays, Batteries- Identification based on visual inspection/Datasheet/specification/Notation

2. Familiarization of multimeters & CROs (Analog and Digital)
3. Soldering practice - Simple circuits (through hole & SMD)
4. Verification of network theorems: KCL , KVL
5. V-I Characteristics of PN junction Diode
6. Half wave rectifier with and with out C filter - Evaluation of Ripple factor
7. Full wave centre tapped rectifier with and with out C filter - Evaluation of Ripple factor
8. Full wave bridge rectifier with and with out C filter - Evaluation of Ripple factor

9. Zener diode voltage regulator (Line regulation & Load regulation)

10. Design and setup an LED Lamp

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
9. End Semester Exam	50
10. End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15
Assignments	10
Lab	5

KU1DSCELE104: Foundations of Electrical and Electronics

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	Minor	100	KU1DSCELE104	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This is a comprehensive introductory course designed to provide a solid understanding of the basic principles and concepts underlying electrical and electronics engineering. Topics covered include basic circuit theories, Resistor, Inductor and Capacitor (RLC)circuits, semiconductor devices like PN Junction Diode,Zener diode, BJT and MOSFET, and Regulated rectifiers. Throughout the course, emphasis is placed on practical applications to reinforce theoretical concepts. By the end of the course, students should have a solid foundation in electrical and electronics engineering principles, preparing them for more advanced coursework or practical applications in the field.

Course Prerequisite: Basic understanding of algebra and trigonometry. Familiarity with basic physics concepts (e.g., Ohm's Law, Newton's Laws).

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Apply basic circuit theories to analyse and solve simple electrical circuits.	A
2	Explain RLC circuits.	U
3	Explain the operation and principles of semiconductor devices	U
4	Design and analyse regulated rectifier circuits	C

5	Develop practical experience through laboratory experiments and projects	C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3						
CO 2							
CO 3							
CO 4	3	3					
CO 5		3					3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Module I**		10
	1.1	Voltage and Current dividers, Kirchhoff's current Law and voltage law (KCL, KVL)	
	1.2	Mesh & Node analysis (DC analysis)	
	1.3	Thevenin's theorem and Norton's theorem	
	1.4	Superposition theorem and Maximum power transfer theorem	
2	**Module II**		10
	2.1	Capacitor - charging and discharging , parallel and series C, AC through C, impedance, X_C,	
	2.2	Inductor – Self and mutual inductance, transformers, X_L, impedance	

	2.3	Concept of L/R and RC time constant, wave shapes, long and short time constants	
	2.4	Concept of filter- RC filters – low pass and high pass, decibel and frequency response curve	

3	**Module III**		10
	3.1	Semiconductors, PN junction, depletion layer, Barrier potential, biasing , reverse break down, depletion layer capacitance, PN junction diode, V-I characteristics	
	3.2	Zener diode, Break down mechanisms, V-I characteristics	
	3.3	Rectifiers – Halfwave, fulwave (center tapped and bridge), Filters	
	3.4	Zener Diode Regulators	

4	**Module IV**		10
	4.1	BJT , contruction, operation and characteristics	
	4.2	MOSFET contruction, operation and characteristics	
	4.3	BJT biaisng (Fixed , emitter and voltage divider)	
	4.4	BJT and MOSFET as switch	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

1. Grob's Basic Electronics: Mitchel E Schultz, Tata McGraw Hill Education , 10thEdition

2. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

Suggested Readings:

- Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition
- A text book of Electrical Technology: B.L.Theraja, S.Chand and Co.
- Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH
- Electronic Devices and Circuits: Bolyestad, TataMcGraw Hill.
- Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition.
- Circuits and Networks- Analysis and Synthesis: Sudhakar A and Shyammohan S Palli,
- McGraw Hill Education (India) Pvt Ltd , 5 th Edition

Laboratory Sessions : Practical sessions to reinforce theoretical concepts

1 : Familiarization of components, Multimeter, CRO and function generator

Objective: To introduce students to essential electronic components and measurement instruments.

Tasks:

Identify and understand the function of common electronic components such as resistors, capacitors, diodes, and transistors.

Learn to use a multimeter for measuring voltage, current, and resistance.

Familiarize with the operation of a Cathode Ray Oscilloscope (CRO) for visualizing and measuring signals.

Understand the function and operation of a function generator for generating different types of waveforms.

2 :Soldering practice

Objective: To develop basic soldering skills for electronic assembly and repair.

Tasks:

Learn soldering safety practices and procedures.

Practice soldering wires, through-hole components, and surface-mount components on a soldering board.

Understand proper soldering techniques including tinning, solder joint formation, and desoldering.

3: Implement resistive network and verify network theorems: Kirchoff's Current Law (KCL) and Kirchoff's Voltage Law (KVL)

Objective: To understand and apply Kirchhoff's laws to analyze resistive networks.

Tasks:

Construct a resistive network using resistors of different values.

Measure currents at various nodes to verify Kirchhoff's Current Law (KCL).

Measure voltages around closed loops to verify Kirchhoff's Voltage Law (KVL).

Compare measured values with theoretical predictions and assess the accuracy of the laws.

4: Implement a Half wave rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To understand the operation of a half-wave rectifier and its ripple reduction using a capacitive filter.

Tasks:

Build a half-wave rectifier circuit using a diode and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Add a capacitive filter to the circuit and measure the ripple voltage reduction.

Calculate and compare ripple factors with and without the capacitive filter.

5: Implement a Full wave centre tapped rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To study the operation of a full-wave center-tapped rectifier and its ripple reduction techniques.

Tasks:

Construct a full-wave center-tapped rectifier using diodes and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Add a capacitive filter to the circuit and measure the ripple voltage reduction.

Calculate and compare ripple factors with and without the capacitive filter.

6 : Implement a Full wave bridge rectifier and evaluate Ripple factor with and with out Capacitive filter

Objective: To investigate the operation of a full-wave bridge rectifier and its ripple reduction methods.

Tasks:

Build a full-wave bridge rectifier circuit using diodes and a load resistor.

Measure the output voltage and ripple using an oscilloscope.

Integrate a capacitive filter into the circuit and measure the resulting ripple voltage reduction.

Determine and compare ripple factors with and without the capacitive filter.

7: Implement a Zener diode voltage regulator and study Line regulation and Load regulation

Objective: To understand the operation of a Zener diode voltage regulator and its regulation characteristics.

Tasks:

Construct a Zener diode voltage regulator circuit with a load resistor.

Vary the input voltage and measure the output voltage to study line regulation.

Change the load resistance and measure the output voltage to study load regulation.

Analyze the stability and performance of the voltage regulator under different conditions.

8:Design and Implement a Voltage divider Biased BJT circuit and verify Q point

Objective: To design and analyze a voltage-divider biased BJT circuit and verify its operating point.

Tasks:

Design a voltage-divider bias circuit using resistors and a bipolar junction transistor.

Calculate the operating point (Q point) of the transistor using DC biasing equations.

Construct the circuit and measure DC voltages and currents to verify the Q point.

Compare measured values with calculated values and assess the stability of the Q point.

9: Design and implement a fixed bias BJT circuit and study variation of Q point with temperature

Objective: To investigate the effects of temperature on the operating point of a fixed bias BJT circuit.

Tasks:

Design a fixed bias BJT circuit using resistors for biasing.

Construct the circuit and measure DC voltages and currents at room temperature.

Heat the transistor using a heat source and observe changes in the Q point.

Measure DC voltages and currents at elevated temperatures and analyze the variation in the operating point.

10:Design a regulated power supply and drive a relay using BJT as a switch

Objective: To design and implement a regulated power supply and use a BJT as a switch to control a relay.

Tasks:

Design a regulated power supply circuit using voltage regulator ICs or discrete components.

Construct the power supply and measure the output voltage and current.

Design a relay driver circuit using a BJT as a switch.

Connect the relay to the power supply and control its operation using the BJT switch.

Verify the functionality of the relay driver circuit and assess its performance.

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

ASSESSMENT RUBRICS

	Marks
End Semester Evaluation	**70**
End Semester Exam	50
End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15
Assignments	10
Lab	5

KU1MDCELE001: Computer Hardware

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	MDC	100	**KU1MDCELE001**	2+0+1	30+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
2	2	0	25	50	75	3

Course Description:

This course provides a comprehensive introduction to the fundamental components and concepts of computer hardware. Through a combination of theoretical knowledge and practical demonstrations, students will gain a solid understanding of personal computer architecture, memory systems, storage devices, peripheral devices, and power supply units. By the end of this course, students will have a solid understanding of the fundamental components and concepts of computer hardware, enabling them to troubleshoot basic hardware issues, make informed decisions regarding hardware upgrades.

Course Prerequisite: No prior knowledge of computer hardware is required

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain Computer Architecture	U
2	Distinguish between different types of memory modules	An

3	Identify and compare various storage devices	A
4	Explain Display Technologies	U
5	Identify and troubleshoot common hardware issues, such as component failures, connectivity problems, and power supply issues	A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2							
CO 3	3						
CO 4							
CO 5	5		3				3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1PC Overview	**PC Overview and Functional Elements**		**5**
	1.1	PC Overview- Introduction to personal computers (PCs), Evolution of PC architecture, Block diagram overview of a typical PC	
	1.2	Functional Elements of a PC- Understanding the components: CPU, memory, storage, input/output devices, Role of each component in the system	
	1.3	CPU: Central Processing Unit- General specifications of microprocessors, Internal cache and its importance, External cache and	

		its role in improving performance, Clock doubling and its impact on CPU performance, Introduction to pipelining and its benefits	
	1.4	Form Factors- Introduction to ATX, NLX, and BTX form factors, Understanding their differences and usage scenarios	
2	**Memory, BIOS and Ports**		**10**
	2.1	Memory Modules- Overview of different memory modules: DRAM, DDR, SDRAM, RDRAM, Understanding SIMM, DIMM, and RIMM modules, Memory banking and its significance in system performance	
	2.2	BIOS Setup and CMOS- Introduction to BIOS (Basic Input/Output System) and its role in system booting, CMOS setup and its configuration options, Flash ROM and its advantages over traditional ROM	
	2.3	Ports- Understanding different ports: COM, LPT, USB, Functions and usage scenarios of each port type	
	2.4	Introduction to USB ports and their prevalence in modern systems	

3	**Storage Devices and Monitors**		**5**
	3.1	Storage Devices- Overview of storage devices: Hard Disk Drives (HDD), CD-ROMs, DVDs, Thumb Drives	
	3.2	Working principles and specifications of each storage device	
	3.3	Understanding different interfaces: IDE, SCSI, SATA	
	3.4	Introduction to LED monitors and their working principles, Understanding display technologies and their impact on image quality, Resolution, refresh rate, and other monitor specifications	

4	**Peripherals and Power Supply**		**5**
	4.1	Peripheral Connectivity- Understanding Bluetooth technology, Introduction to Wi-Fi connectivity	
	4.2	Printers- Types of printers: Dot Matrix, Laser, Inkjet, Working	

		principles and applications of each printer type, Introduction to Bluetooth and Wi-Fi printing technologies	
	4.3	SMPS and UPS- Overview of different types of Switched-Mode Power Supplies (SMPS)	
	4.4	Understanding Uninterruptible Power Supply (UPS) and its role in system reliability, Importance of backup power solutions in modern computing environments	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

1. Structured computer organization : Andrew &Tanenbaum

2. Computer organization : John P. Hayes

3. PC Hardware The Complete Reference: Craig Zacker & John Rourke

4. Computer organization :Hamacher&Zaky

5. Trouble shooting maintain & repairing PCs: Stephen J Bigelaw

6. IBM PC and CLONES:Hardware, Troubleshooting and Maintenance:B GovindaRajalu

Suggested Readings:

1. The Indispensable PC Hardware Book: Hans-Peter Messmer

2. Computer Organization and Design: The Hardware/Software Interface: David A. Patterson and John L. Hennessy

3. Computer Hardware: Installation, Interfacing, Troubleshooting, and Maintenance: Debashis De

4. Upgrading and Repairing PCs: Scott Mueller

TEACHING LEARNING STRATEGIES

Lectures: Theory sessions covering fundamental concepts and principles.

Practical:

1. Familiarize computer
    Objective: Familiarize with components of a Computers
    Task:
        Open the CPU of a PC and recognize components
2. Install Printers
    Objective : Connect a printer and take Print out
    Task:
        Connect Printer to PC
        Download and install printer driver
        Take a printout
3. Install Ubuntu operating system on a computer
4. Establish wired connectivity & Wireless Connectivity
5. Setup BIOS

Each laboratory experiment should be accompanied by a detailed lab note containing Aim, methodology and results obtained.

ASSESSMENT RUBRICS

	Marks
End Semester Evaluation	**50**
End Semester Exam (Theory only)	50
Continuous Evaluation	**25**
Tests	10
Practical	15

KU1MDCELE002: Electronics for You

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
1	MDC	001	KU1MDCELE002	2+0+1	30+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
2	2	0	25	50	75	3

Course Description:

This course aims to introduce Electronic equipments used in daily life to students from various disciplines. People are always interacting with electronic gadgets such as mobile phones, office equipments and biomedical systems. A basic understanding of gadget operation will definitely improve their daily life at home, office and public places. This course gives an insight in this regard. At the end of this course students will be able to manage their electronic gadgets without external support.

Course Prerequisite: None

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain basic Electrical parameters	U
2	Explain the working of Audio systems, DTH, projectors and printers	U

3	Compare mobilephone generations	U
4	Explain the operation of biomedical instruments	U
5	Make use of these knowledge to set up a practical system	A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2	2						
CO 3	2						
CO 4	2						
CO 5	3	3	2	2			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Module I**		**5**
	1.1	DC voltage and current , Ohms law, AC Voltage and current	
	1.2	Sine wave, peak r.m.s and average Voltage, frequency	
	1.3	Concept of DC power, AC power and power factor	
	1.4	Role of Resistor, Capacitor and Inductor in electronics	
2	**Module II**		**5**
	2.1	Working of Audio systems : PA system – Microphone, Amplifier, Loudspeakers	
	2.2	Block diagram and operation of DTH	

	2.3	Projectors – LCD and DLP, Printers: Dot matrix, Inkjet and Laser	
	2.4	LCD, Plasma & LED TV	

3	**Module III**		**10**
	3.1	Mobile phones – Cells, 2G, 3G, 4G & 5G standards and comparison	
	3.2	Block diagram of a mobile phone network	
	3.3	How call is established (emphasis on important registers in MSC)	
	3.4	SIM, IMEI number,SAR, Bluetooth & WIFI	

4	**Module IV**		**5**
	4.1	Cells and their structure, Cell as a bio-electric generator	
	4.2	Working of of ECG Machine	
	4.3	Pacemaker and Defibrillator	
	4.4	Working of X-Ray machine, Ultra sound scan and CT Scan	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

1. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition

2. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

3. R. P. Bali Consumer Electronics Pearson Education (2008)

4. R. G. Gupta Audio and Video systems Tata McGraw Hill (2004)

5. Wireless Communications: Theodore S. Rappaport; Pearsons

6. Khandpur, R.S., Handbook of Biomedical Instrumentation, McGraw Hill (2003) 2ndedn

Practicals:

1. Identify various sections of a practical DTH System
2. Pair an LED TV with a mobile pohone for Power point presentation
3. Connect a Project to a lap top
4. Connect a Printer with a Laptop (Install lnecessary driver softwares)
5. Setup a sound system having wireless microphone

Each laboratory experiment should be accompanied by a detailed lab note containing Aim, methodology and results obtained.

ASSESSMENT RUBRICS

	Marks
End Semester Evaluation	**50**
End Semester Exam (Theory only)	50
Continuous Evaluation	**25**
Tests	10
Practical	15

Semester -II

Sl.No.	Course Type	Course Title	Course Code	Credit
1	Major	Fundamentals of Digital Circuits	KU2DSCELE105	4
2	Minor	Introduction to 8051 Microcontroller	KU2DSCELE106	4
		Electronic Devices and Circuits	KU2DSCELE107	4
		Digital Electronics	KU2DSCELE108	4
3	Multi Disciplinary Course (MDC)	R and Python for Data Analysis	KU2MDCELE003	3

KU2DSCELE105: Fundamentals of Digital Circuits

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
2	Core	100	KU2DSCELE105	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course aims to develop knowledge about Digital Electronics. The course cover number system, logic gates, logic families, combinational circuits, Flip flops, shift registers and counters. Practical sessions are also included in this course.

Course Prerequisite: Basic Understanding of Electronics at higher secondary level

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain different number systems	U
2	Apply Boolean algebra rules and Karnaugh map	A
3	Compare Logic families	U
4	Develop combinational and sequential circuits	A
5	Design and develop digital circuit and systems	C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create ©***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2	2	3	2	3			
CO 3	3	2		2			
CO 4	3	3	3	3			
CO 5	3	3	2	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Module I**		**10**
	1.1	Number systems – Decimal, Binary, Octal & Hexadecimal	
	1.2	conversions, Digital codes – BCD, Excess 3, Gray code	
	1.3	Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table	
	1.4	Boolean algebra & theorems, De Morgan's theorem, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).	
2	**Module II**		**10**
	2.1	Different Logic families: TTL, CMOS, ECL & its characteristics.	
	2.2	Combinational circuits: Adders - Half adder and Full adder.	

		Subtractors - Half and Full Subtractor.	
	2.3	Comparators - 1 bit magnitude & 2 bit magnitude. Decoders - 2 to 4 & 3 to 8.	
	2.4	Encoders – Octal to Binary & Decimal to BCD, Code converters - Gray to Binary, Binary to Gray and Binary to BCD.	

3	**Module III**		**10**
	3.1	Multiplexers: 2 input, 4 input & 8 input.	
	3.2	Demultiplexers: 1 to 4 & 1 to 8.	
	3.3	Realization of Boolean expression using multiplexers and demultiplexers.	
	3.4	Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T and Master slave	

4	**Module IV**		**10**
	4.1	Counters: Ripple Binary counter, up counter, down counter, concept of modulus counters, Decade counter	
	4.2	Shift registers: SISO, SIPO, PISO, PIPO shift registers	
	4.3	Ring counter, Johnsons counter	
	4.4	Design for random sequence generator	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

11.1. Thomas L Floyd, Digital Fundamentals, Pearson, 2011.

2. Anandkumar, Fundamentals of digital circuits, PHI, 2012.

Suggested Readings:

1. John MYarbrough, Digital logic- Application and Design, Thomson Learning,2006.

2. John Wakerly, Digital Design Principles and Practice, Pearson,4/e, 2012.

3. Morris Mano,Ciletti, Digital Design, 4/e, Pearson ,4/e, 2009

4. Thomas A.DeMessa, Zack Ciecone: Digital Integrated Ciruits, Wiley India,2007

5. Ghoshal, Digital Electronics, Cengage, 2012.

6. Malvino& Leach, Digital principles and applications, TMH.

LAB EXPERIMENTS

1. Realization of basic gates using NAND gate
2. Realization of basic gates using NOR gate
3. Realize Half adder
4. Realize Full adder
5. Realize Halfsubtractor
6. Realize Full Subtractor
7. Realize 2 X 1 and 4 X 1 Multiplexers using logic gates
8. Realize SR, JK and D flipflop using NAND gate
9. Setup a partity checker
10. Setup a Digital circuit for water level controller

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
1. End Semester Exam	50
2. End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15

Assignments	10
Lab	5

KU2DSCELE106: Introduction to 8051 Microcontroller

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
2	Minor	100	**KU2DSCELE106**	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course provides an introduction to the architecture, programming, and applications of 8051 microcontrollers. Students will learn about the internal structure of the 8051 microcontroller, its instruction set, memory organization, I/O ports, timers/counters, and serial communication. Practical hands-on exercises and projects will reinforce theoretical concepts, enabling students to develop skills in 8051 programming and interfacing with peripherals. By the end of the course, students will be able to develop embedded systems applications and pursue further studies or careers in the field of embedded systems engineering.

Course Prerequisite: Basic understanding of digital electronics and computer architecture. Knowledge of programming fundamentals in any language .

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain of 8051 Microcontroller Architecture	U
2	Construct Assembly Language programmes for 8051 Microcontroller	C

3	Develop problem-solving abilities by designing and implementing algorithms and programs to solve real-world problems using the 8051 microcontroller.	C
4	Develop simple embedded systems using the 8051 microcontroller	C
5	Develop practical experience through laboratory experiments and projects	C

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1							
CO 2							
CO 3	3				3		
CO 4	3			3		3	
CO 5		3					3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Introduction to Microprocessors and Microcontrollers**		**5**
	1.1	Definition and characteristics of microprocessors and microcontrollers	
	1.2	Evolution and history of microprocessors and microcontrollers	
	1.3	Overview of the role and significance of microprocessors and microcontrollers	
	1.4	Block diagram and components of a typical microprocessor	
2	**8051 Microcontroller Architecture**		**10**

	2.1	Overview of 8051 microcontroller family	
	2.2	Block diagram and internal structure	
	2.3	CPU architecture: registers, ALU, program counter, stack pointer	
	2.4	Memory organization: ROM, RAM, special function registers (SFRs)	

3	**Assembly Language Programming for 8051**		**13**
	3.1	Introduction to assembly language	
	3.2	8051 instruction set overview	
	3.3	Addressing modes and instruction format	
	3.4	Writing simple assembly language programs for the 8051	

4	**I/O Ports and Interfacing**		**12**
	4.1	Understanding I/O ports and their configurations	
	4.2	Input/output operations using ports	
	4.3	Interfacing LEDs, switches, and other peripherals	
	4.4	Case studies of embedded systems using 8051 microcontrollers	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

12. The 8051 Microcontroller, Architecture, Programming and Application : Kenneth J. Ayala, Penram International.

13. The 8051 Microcontroller And Embedded Systems, Using Assembly and C : M.A. Mazidi, J. G. Mazidi, R.D. Mckinlay - Pearson Education

14. Microprocessor Architecture, Programming, and Applications with the 8085 : Ramesh S. Gaonkar

Suggested Readings:

1. The 8051 Microcontroller And Embedded Systems, Using Assembly and C : Kenneth J. Ayala, Dhanjay V. Gadre

2. Microcontrollers Theory and Applications : Deshmukh Ajay V, TMH

3. 8051 Microcontroller: Architecture, Programming, and Interfacing : Subrata Ghoshal.

TEACHING LEARNING STRATEGIES

Lectures: Theory sessions covering fundamental concepts and principles.

Assignments: Problem-solving assignments to reinforce understanding.

Laboratory session: Practical sessions for programming and interfacing experiments.

1: Familiarization with 8051 Development Board

Objective: Introduce students to the components and features of an 8051 development board.

Tasks:

Identify and understand the various components on the development board (microcontroller, crystal oscillator, LEDs, switches, LCD display, etc.).

Learn how to connect the development board to a computer for programming and debugging.

Power up the board and verify basic functionality (blinking LEDs, reading switch inputs, displaying messages on LCD).

2: LED Blinking

Objective: Write a simple program to blink LEDs connected to different I/O pins of the 8051 microcontroller.

Tasks:

Write an assembly language program to toggle the state of an I/O pin connected to an LED.

Upload and run the program on the 8051 microcontroller.

Observe the blinking of LEDs and verify the timing using an oscilloscope

3: Dancing LED

Objective: Write a program to create a dancing LED effect

Tasks:

Connect eight LED to one of the I/O port of the 8051 through a current-limiting resistor.

Write a program in assembly language to toggle the state of each LED sequentially to create a dancing LED effect.

Upload and run the program on the 8051 microcontroller.

Observe the blinking pattern of LEDs and create new pattern by changing program

4: Seven segment LED interface

Objective: Interface a seven segment LED display with the 8051 microcontroller and display numbers

Tasks:

Connect a seven segment LED display module to the 8051 development board.Write a program to display a number.

Modify the program to display different numbers sequentially.

Upload and run the program, and verify the displayed output.

5: Switch Input and Output

Objective: Read input from switches and control output to LEDs using the 8051 microcontroller.

Tasks: Connect multiple switches to different I/O pins of the 8051.

Write a program to read the status of switches and control the corresponding LEDs.

Upload and run the program on the microcontroller.

Test the functionality by pressing switches and observing changes in LED states.

6: Project

Objective: Apply the concepts learned in previous experiments to design and implement a practical embedded system project

Tasks: Select a project idea based on the student's interest and complexity level

Design the hardware and software components required for the project.

Implement the project using the 8051 microcontroller and necessary peripherals.

Test and debug the project, and demonstrate its functionality

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
End Semester Exam	50
End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15
Assignments	10
Project Evaluation: Assessment of project work based on design, implementation, and presentation.	5
lab	

KU2DSCELE107: Electronic Devices and Circuits

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
2	Minor	100	KU2DSCELE107	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course aims to develop skills in designing circuits based on BJT, FET, MOSFET and thyristors. Working principle of BJT is explained in Unit I. Unit II explains the design of a CE Amplifier module. The working principle of FET, MOSFET and thyristors are also explained in detail. After the successful completion of this course the student will be able to design circuits bsed on above devices. Practical sessions are also included.

Course Prerequisite: Basic understanding of Electronics at higher secondary level

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the working of BJT, FET and Thyristors	U
2	Design biasing circuits for BJT	C
3	Design single stage BJT amplifier	C
4	Compare BJT, FET, MOSFET & Thyristors in terms of construction, merits and demerits & Applications	U
5	Design and develop electronic circuits and systems	C

**Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1		2					
CO 2	3	3	2	3			
CO 3	3	3	2	3			
CO 4	2	2					
CO 5	3	3	3	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Module I**		**10**
	1.1	Bipolar Junction Transistor (BJT) symbol, types (NPN and PNP), construction, working principle,parameters	
	1.2	BJTamplification,BJT switching, Transistor configurations- CB, CE and CC , characteristics	
	1.3	DC load line (CE), Q point, factors affecting the stability	
	1.4	Biasing circuits-fixed bias, emitter feedback bias , voltage divider, thermal stability	
2	**Module II**		**10**
	2.1	AC analysis, Coupling and byepass capacitors, AC load line and equivalent circuits	
	2.2	Transistor models – RE model Hybrid equivalent circuits	

	2.3	CE circuit analysis, - Small signal amplifier, Design of single stage RC Coupled amplifier	
	2.4	Effect of coupling capacitor and bypass capacitor on frequency response	

	Module III		**10**
3	3.1	Construction, working principle,Symbol, types, V-I characteristics, Specifications and parameters of Junction Field Effect Transistor (JFET)	
	3.2	Construction, working principle,Symbol, types, V-I characteristics, Specifications and parameters of Metal Oxide Semiconductor FET (MOSFET)	
	3.3	MOSFET Based practical switching circuits	
	3.4	Comparison of JFET, MOSFET and BJT, Applications	

	Module IV		**10**
4	4.1	Construction, working principle,Symbol, V-I characteristics, Specifications and parameters of SCR	
	4.2	Construction, working principle,Symbol, V-I characteristics, Specifications and parameters of TRIAC	
	4.3	Construction, working principle,Symbol, V-I characteristics, Specifications and parameters of DIAC	
	4.4	Construction, working principle,Symbol, V-I characteristics, Specifications and parameters of UJT	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected		

area/ activity

Essential Readings:

1. Electronic devices and circuits : David A Bell, Oxford University Press, 5 th edition

2. A text book of Applied Electronics : R. S. Sedha, S Chand Company Ltd

Suggested Readings:

1. Basic Electronics Solid state : B. L. Theraja, S Chand Company Ltd, 5 th edition

2. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012

3. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., TMH

4. Electronic Devices and Circuits: Bolyestad, Tata McGraw Hill.

LAB EXPERIMENTS

1. V-I Characteristics of the Common Emitter configuration of BJT

2. Design Transistor Biasing circuits (Fixed Bias and Voltage divider bias) for a given specification

3. Design a Single Stage CE amplifier for a given gain

4. Design BJT as a switch and drive a relay

5. Design a PNP transistor based switching circuit

6. Implement a Fixed bias circuit and study the Q point variation with respect to temperature

7. Design a FET based switching circuit

8. Design and implement MOSFET switching circuit and drive a relay

9. Design and setup Thyristor based light intensity controller

10. Design a BJT based audio frequency amplifier. Condenser microphone is to be connected at the input and observe the output signal.

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

Assessment Rubrics:

	Marks
End Semester Evaluation	**70**
1. End Semester Exam	50
2. End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15
Assignments	10
Lab	5

KU2DSCELE108: Digital Electronics

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
2	Minor	100	KU2DSCELE108	3+0+1	45+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
3	2	0	30	70	100	3

Course Description:

This course aims to develop knowledge about Digital Electronics. The course cover number system, logic gates, logic families, combinational circuits, Flip flops, shift registers and counters. Practical sessions are also included in this course.

Course Prerequisite: Basic understanding of Electronics at higher secondary level

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain different number systems	U
2	Apply Boolean algebra rules and Karnaugh map	A
3	Compare Logic families	E
4	Develop combinational and sequential circuits	A
5	Design and develop digital circuit systems	C

Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2	2	3	2	3			
CO 3	3	2		2			
CO 4	3	3	3	3			
CO 5	3	3	2	3			3

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	UNIT	DESCRIPTION	HOURS
1	**Module I**		**10**
	1.1	1.1Number systems – Decimal, Binary, Octal & Hexadecimal	
	1.2	conversions, Digital codes – BCD, Excess 3, Gray code	
	1.3	Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table.	
	1.4	Boolean algebra & theorems, De Morgan's theorem, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 4 variables).	
2	**Module II**		**10**
	2.1	Different Logic families: TTL, CMOS, ECL & its characteristics.	
	2.2	Combinational circuits: Adders - Half adder and Full adder.	

		Subtractors - Half and Full Subtractor.	
	2.3	Decoders - 2 to 4 & 3 to 8.	
	2.4	Encoders – Octal to Binary & Decimal to BCD, Code converters - Gray to Binary, Binary to Gray and Binary to BCD.	

3	**Module III**		**10**
	3.1	3.1 Multiplexers: 2 input, 4 input & 8 input.	
	3.2	Demultiplexers: 1 to 4 & 1 to 8.	
	3.3	Realization of Boolean expression using multiplexers and demultiplexers.	
	3.4	Sequential circuits: Flip Flops: RS latch, clocked RS, D, JK, T and Master slave	

4	**Module IV**		**10**
	4.1	4.1 Counters: Ripple Binary counter, up counter, down counter	
	4.2	Shift registers: SISO, SIPO, PISO, PIPO shift registers	
	4.3	Ring counter, Johnsons counter	
	4.4	Design for random sequence generator	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		
	Space to fill the selected area/ activity		

Essential Readings:

15. 1. Thomas L Floyd, Digital Fundamentals, Pearson, 2011.

2. Anandkumar, Fundamentals of digital circuits, PHI, 2012.

Suggested Readings:

1. John MYarbrough, Digital logic- Application and Design, Thomson Learning,2006.

2. John Wakerly, Digital Design Principles and Practice, Pearson,4/e, 2012

3. Morris Mano,Ciletti, Digital Design, 4/e, Pearson ,4/e, 200

4. Thomas A.DeMessa, Zack Ciecone: Digital Integrated Ciruits, Wiley India,200

5. Ghoshal, Digital Electronics, Cengage, 2012

6. Malvino& Leach, Digital principles and applications, TMH.

LAB EXPERIMENTS

1. Realization of basic gates using NAND gate
2. Realization of basic gates using NOR gate
3. Realize Half adder
4. Realize Full adder
5. Realize Halfsubtractor
6. Realize Full Subtractor
7. Realize 2 X 1 and 4 X 1 Multiplexers using logic gates
8. Realize SR, JK and D flipflop using NAND gate
9. Setup a partity checker
10. Setup a Digital circuit for water level controller

Each laboratory experiment should be accompanied by a detailed lab note containing theoretical background, experimental procedures, circuit diagrams, program listings, and expected outcomes.

ASSESSMENT RUBRICS

	Marks
End Semester Evaluation	**70**
End Semester Exam	50
End Semester Practical Exam	20
Continuous Evaluation	**30**
Tests	15

Assignments	10
Lab	5

KU2MDCELE003: R and Python for Data Analysis

Semester	Course Type	Course Level	Course Code	Credits (L+T+P)	Total Hours (L+T+P)
2	MDC	001	KU2MDCELE003	2+0+1	30+0+30

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical	Tutorial	CE	ESE	Total	
2	2	0	25	50	75	3

Course Description:

This course offers a comprehensive introduction to two of the most widely used programming languages in data analysis: Python and R. Participants will learn the fundamentals of both languages and will explore data visualization techniques. The course will also cover statistical analysis topics such as probability distributions and hypothesis testing using both Python and R. By the end of this course, participants will have the skills and confidence to analyze and visualize data effectively using Python and R, making them valuable assets in the rapidly growing field of data analytics.

Course Prerequisite: Basic knowledge of programming concepts is helpful but not mandatory.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Explain the fundamentals of programming in Python	U
2	Explain the fundamentals of programming in R	U

3	Demonstrate data visualization tasks using Python and R	U
4	Apply probability distributions to draw insights from data using Python and R	A
5	Apply hypothesis testing to draw insights from data using Python and R	A

****Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)***

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	2						
CO 2	2						
CO 3	2	3			3	3	
CO 4	3	3			3	3	
CO 5	3	3			3	3	

COURSE CONTENTS

Contents for Classroom Transaction:

MODULE	**UNIT**	**DESCRIPTION**	**HOURS**
1	**Module I : Introduction to Python and Pandas**		**5**
	1.1	Python installation, variables and operators, reading data from keyboard, Data types - numbers, lists, dictionary	
	1.2	Decision making Loops - for, while; Loop control statements - break, continue, pass	
	1.3	Introduction to Pandas - Pandas Installation, data structures - series, data frame	

	1.4	Reading from csv files, loc(), iloc() function, writing back to csv files	
2	**Module II : Introduction to R Programming**		**10**
	2.1	R programming installation and running, Variables, Operators, Data Types	
	2.2	Decision making, Loops, Functions	
	2.3	Packages - installation, loading, Introduction to dplyr Library, dplyr functions	
	2.4	Reading from csv files, writing back to csv files,	

3	**Module III : Data Visualization**		**5**
	3.1	Bar charts, grouped bar charts, stacked bar charts, histogram, line charts using Python	
	3.2	Pie charts, box plots, scatter plots, density plots, strip charts, QQ plots using Python	
	3.3	Bar charts, grouped bar charts, stacked bar charts, histogram, line charts using R	
	3.4	Pie charts, box plots, scatter plots, density plots, strip charts, QQ plots using R	

4	**Module IV : Data Analysis**		**5**
	4.1	Binomial and exponential distribution using Python	
	4.2	One sample Z-Test and two sample Z-Test using Python	
	4.3	Binomial and exponential distribution using R	
	4.4	One sample Z-Test and two sample Z-Test using R	
5	**Teacher Specific Module**		**5**
	Directions: Teacher can design this module based on their expertise and demand from the students		

Space to fill the selected area/ activity

Essential Readings:

1. PYTHON FOR DATA ANALYSIS: Data Wrangling with pandas, NumPy, and Jupyter by Wes Mckinney : O'Reilly

2. Python Data Science Handbook: Essential Tools For Working With Data by Jake VanderPlas : O'Reilly

3. R for Data Science: Import, Tidy, Transform, Visualize, and Model Data by Hadley Wickham and Garrett Grolemund : Shroff/O'Reilly, 2017

4. Hands on Programming With R: Write Your Own Functions and Simulations by Garrett Grolemund, Shroff/O'Reilly

Practicals:

ASSESSMENT RUBRICS

	Marks
End Semester Evaluation	**50**
End Semester Exam (Theory only)	50
Continuous Evaluation	**25**
Tests	10
Practical	15