

B.Sc., ELECTRONICS AND COMMUNICATION

Syllabus

Program Code: UEL

2021-2022 onwards



MANNAR THIRUMALAI NAICKER COLLEGE

(AUTONOMOUS)

Re-accredited with “A” Grade by NAAC

PASUMALAI, MADURAI – 625 004

Eligibility for Admission

Candidates seeking admission to the B.Sc (E&C) Degree course must have the Higher Secondary Education, (should have studied Physics or Mathematics in HSC) of the Government of Tamil Nadu or any other state or its equivalent qualification.

Subjects of Study

Part I : Tamil / Company Secretarial Practice and Modern Office Management

Part II : English

Part III :

1. Core Subjects
2. Allied Subjects
3. Electives

Part IV :

1. Non Major Electives (II Year)
2. Skill Based Subjects
3. Environmental Studies - Mandatory Subject
4. Value Education - Mandatory Subject

Part V :

Extension Activities

Pattern of the question paper for the Continuous Internal Assessment

Note: Duration – 1 hour

(For Part I, Part II & Part III)

The components for continuous internal assessment are:

Part –A

Four multiple choice questions (answer all) 4 x 01= 04 Marks

Part –B

Three short answers questions (answer all) 3 x 02= 06 Marks

Part –C

Two questions (‘either or ‘type) 2 x 05=10 Marks

Part –D

Two questions out of three 1 x 10 =10 Marks

Total -----
30 Marks

The scheme of Examination for Part-I, II & III

The components for continuous internal assessment are:

(60 Marks of two continuous internal assessments will be converted to 15 marks)

Two tests and their average --15 marks

Seminar /Group discussion --5 marks

Assignment --5 marks

Total 25 Marks

Pattern of the question paper for the Summative Examinations:

Note: Duration- 3 hours

Part –A

Ten multiple choice questions 10 x01 = 10 Marks

No Unit shall be omitted: not more than two questions from each unit.)

Part –B

Short answer questions (one question from each unit) 5 x02 = 10 Marks

Part –C

Five Paragraph questions ('either or 'type) 5 x 05 = 25 Marks

(One question from each Unit)

Part –D

Three Essay questions out of five 3 x 10 =30 Marks

(One question from each Unit)

Total 75 Marks

Part-IV- Skill Based Papers / NME:

The Scheme of Examination for Skill Based Papers: (Except Practical Lab Subjects)

Pattern of the questions paper for the continuous Internal Assessment

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks) and converted for 15 marks

The components for continuous internal assessment are:

Two tests and their average --15 marks

Seminar /Group discussion --5 marks

Assignment --5 marks

Total 25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Skill Based Papers (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

Part-IV- Environmental Studies and Value Education

The Scheme of Examination (Environmental Studies and Value Education)

Two tests and their average	--15 marks
Project Report	<u>--10 marks*</u>
Total	<u>--25 marks</u>

* The students as Individual or Group must visit a local area to document environmental assets – river / forest / grassland / hill / mountain – visit a local polluted site – urban / rural / industrial / agricultural – study of common plants, insects, birds – study of simple ecosystem – pond, river, hill slopes, etc.

Question Paper Pattern

(Internal Assessment)

Pattern of the Question Paper for Environmental Studies & Value Education only) (Internal)

45 MCQs will be asked for each internal assessment tests (45 x 1=45 Marks) and converted for 15 marks

Two tests and their average	--	15 marks
Project	--	10 marks

Total		25 Marks

Summative Examination Pattern

Pattern of the Question Paper for Environmental Studies & Value Education only) (External)

75 Multiple choice questions will be asked from five units (75 x 1=75 Marks)

(15MCQ's from each unit)

Part V Extension Activities: (Maximum Marks: 100)

1. NCC
2. NSS
3. Physical Education
4. YRC
5. RRC
6. Health & Fitness Club
7. Eco Club
8. Human Rights Club

Pattern of the Question Paper for (Internal Examination & Summative Examination)

Internal Examinations - - 40 Marks

Summative Examinations - - 60 Marks

100

Minimum Marks for a Pass

40% of the aggregate (Internal +Summative Examinations).

No separate pass minimum for the Internal Examinations.

27 marks out of 75 is the pass minimum for the Summative Examinations.

Vision

To equip the students to increase their practical skills

Mission

To enhance the students to be technical in par with the industry

The 12 Graduate Attributes*:

1. (KB) A knowledge base for engineering: Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
2. (PA) Problem analysis: An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions
3. (Inv.) Investigation: An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. (Des.) Design: An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. (Tools) Use of engineering tools: An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
6. (Team) Individual and teamwork: An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. (Comm.) Communication skills: An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. (Prof.) Professionalism: An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. (Impacts) Impact of engineering on society and the environment: An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such

interactions; and the concepts of sustainable design and development and environmental stewardship.

10. (Ethics) Ethics and equity: An ability to apply professional ethics, accountability, and equity.
11. (Econ.) Economics and project management: An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
12. (LL) Life-long learning: An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge

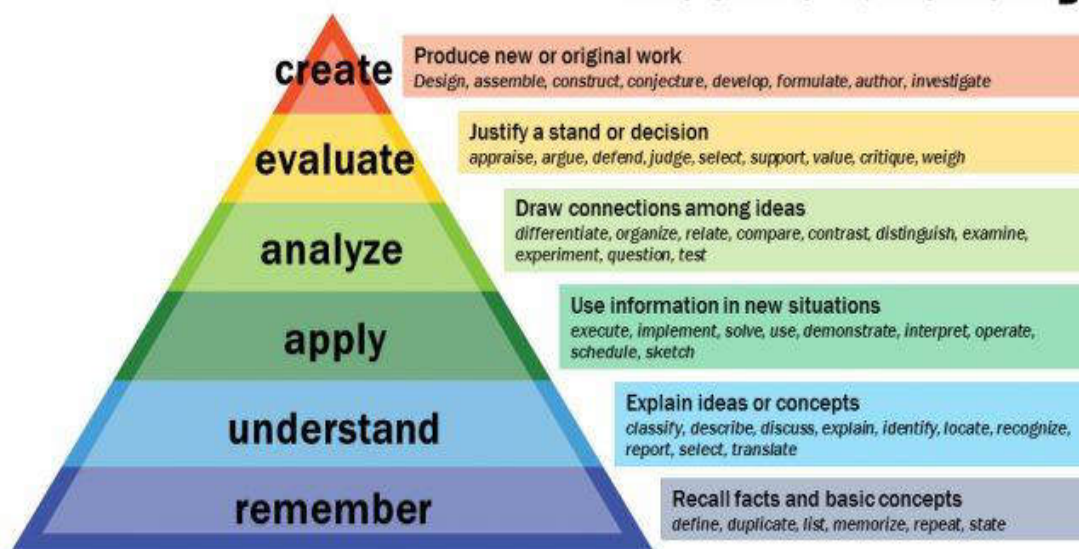
WA	Graduate Attributes	Caption as
WA1	A knowledge base for Electronic Science: Provide graduates with a strong foundation in Electronics domain and to enable them to devise and deliver efficient solutions to challenging problems in Electronics, Communications and allied disciplines.	Knowledge Base
WA2	Problem Analysis: Identify, formulate, r view research literature and analyze complex technical problems reaching substantiated conclusion using principles of Mathematics and Electronic Sciences	Problem Analysis
WA3	Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions	Investigation
WA5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern tools including prediction and modeling to complex technical activities with an understanding of the limitations.	Use of modern tools
WA9	Individual and team work: Function effectively as an individual nd as a member or leader in diverse teams, and in multidisciplinary fields.	Individual and team work
WA12	Life-Long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.	Life-Long learning

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)	
PEO1:	To prepare Graduates with sound foundation in fundamentals of basic sciences and to assist them exhibit strong, independent learning, analytical & problem solving skills in Electronics and Communication.
PEO2:	To facilitate learning in the core field of Electronics and Communication so as to integrate technological progression and hardware skills to produce high impact, energy efficient and cost effective solutions.
PEO3:	To prepare Graduates to effectively use modern equipments and software tools to solve disciplinary problems that are technically sound, economically feasible and social acceptable
PEO4:	To assist and enable individuals acquire skills to life-long learning in the field of Electronics and Communication and innovations so as to have progressive careers as Application Engineers or Entrepreneurs.
PEO5:	To inculcate professional and ethical attitude, team spirit, leadership qualities and effective communication skills in Graduates and to make them aware of their social responsibilities.
PEO6:	Develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.

PO NO	PROGRAMME OUTCOMES (POs)	
At the end of the programme, the students will be able to		
PO – 1	Demonstrate the knowledge and understanding of Science concepts and its relevant fields.	Disciplinary Knowledge
PO – 2	Identify, formulate, analyse complex problems and reach valid conclusions using the methodologies of Science.	Problem Solving
PO – 3	Employ critical and analytical thinking in understanding the concepts and apply them in various problems appearing in different branches of Science.	Analytical Reasoning & Critical Thinking
PO - 4	Communicate the known concepts effectively within the profession and with any forum	Communication Skills
PO - 5	Function successfully as a member/leader in any team and to apply ethics, accountability and equity in their life.	Team Work and Moral/Ethical Awareness
PO - 6	Use ICT tools in various learning situations, related information sources, suitable software to analyze data and furthermore participating in learning activities throughout life to meet the demands of work place through knowledge /up-skilling / re-skilling	Digital Literacy & Life-long Learning

PROGRAM SPECIFIC OUTCOME (PSOs)	
PSO1:	Connect learning from Core and Disciplinary/Interdisciplinary elective courses of Electronics and Communication Science to assimilate technological advancements in the field for designing suppresses to arrive at the solution to societal problems.
PSO2:	Acquire hardware and software skills pertinent to industry practices in the field of Electronics & Communication Science while acquiring soft skills like persistence, proper solutions through projects and industrial interactions.
PSO3:	Ability to identify indigenous processes and components for producing high quality, compact, energy efficient and eco-friendly solutions at cost effective prices for existing and new applications related to Electronics & Communication industry.
PSO4:	Focus on acquiring right knowledge of aptitude and attitude so as to be a candidate of best choice for higher education, placements or to become an Energetic and technical Entrepreneur in the society.
PSO5:	Graduates will be able to apply fundamentals of electronics in various domains of analog and digital systems.
PSO6:	Use embedded system concepts for developing IoT applications

Bloom's Taxonomy



**MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS),
MADURAI**

B.Sc ELECTRONICS AND COMMUNICATION. CURRICULUM

(For the student admitted during the academic year 2021-2022 onwards)

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
FIRST SEMESTER						
Part – I	Tamil / Alternative Course					
21UTAG11	இக்காலக் கவிதையும் நாடகமும்	6	3	25	75	100
Part – II	English					
21UENG11	Communicative English – I	6	3	25	75	100
Part - III	Core Courses					
21UELC11	Semiconductor Devices	5	5	25	75	100
21UELCP1	Electronics-I Lab	4	2	40	60	100
Part III	Allied Course					
21UELA11	Basic Electricity and circuits	5	5	25	75	100
Part IV	Skill Based Course					
21UELS11	Electronic Instrumentation	2	2	25	75	100
Part IV	Mandatory Course					
21UEVG11	Environmental Studies	2	2	25	75	100
	Total	30	22	190	510	700
SECOND SEMESTER						
Part – I	Tamil / Alternative Course					
21UTAG21	இடைக்கால இலக்கியமும் சிறுகதையும்	6	3	25	75	100
Part – II	English					
21UENG21	Communicative English - II	6	3	25	75	100
Part – III	Core Courses					
21UELC21	Electronic Circuits	5	5	25	75	100
21UELCP2	Electronics-II Lab	4	2	40	60	100
Part III	Allied Course					
21UELA21	Probability and Statistics	5	4	25	75	100
Part IV	Skill Based Course					
21UELS21	Electronic Communication Systems	2	2	25	75	100
Part IV	Mandatory Course					
21UVLG21	Value Education	2	2	25	75	100
	Total	30	21	190	510	700

Course Code	Title of the Course	Hrs	Credits	Maximum Marks		
				Int	Ext	Total
THIRD SEMESTER						
Part – I	Tamil / Alternative Course					
21UTAG31	காப்பிய இலக்கியமும் உரைநடையும்	6	3	25	75	100
Part – II	English					
21UENG31	Communicative English – III	6	3	25	75	100
Part - III	Core Courses					
21UELC31	Digital Electronics	5	5	25	75	100
21UELCP3	Digital Electronics Lab	4	2	40	60	100
Part III	Allied Course					
21UCSA31	Programming in C	5	5	25	75	100
Part IV	Skill Based Course					
21UELS31	Computer Oriented Office Automation	2	2	25	75	100
Part IV	Non-Major Elective Course					
21UELN31	Basic Electronics	2	2	25	75	100
	Total	30	22	190	510	700
FOURTH SEMESTER						
Part – I	Tamil / Alternative Course					
21UTAG41	பண்டைய இலக்கியமும் புதினமும்	6	3	25	75	100
Part – II	English					
21UENG41	Communicative English - IV	6	3	25	75	100
Part - III	Core Courses					
21UELC41	Linear Integrated Circuits	5	5	25	75	100
21UELCP4	Linear Integrated Circuits Lab	4	3	40	60	100
Part III	Allied Course					
21UMCA42	Numerical Aptitude	5	5	25	75	100
Part IV	Skill Based Course					
21UELS41	Fiber Optic Communication Systems	2	2	25	75	100
Part IV	Non-Major Elective Course					
21UELN41	Electronics in Everyday life	2	2	25	75	100
Part V	Extension Activities					
21UEAG40 - 21UEAG49	NSS, NCC, YRC	-	1	40	60	100
	Total	30	24	230	570	800

FIFTH SEMESTER						
Part - III	Core Courses					
21UELC51	Microprocessor Interfacing and Its Applications	6	5	25	75	100
21UELC52	Communication Systems	6	5	25	75	100
21UELC55	Microprocessor and Interfacing Lab	3	2	40	60	100
21UELC56	Communication Lab.	3	2	40	60	100
Part III	Core Elective - I					
21UELE51	Microwave and Radar systems	5	5	25	75	100
21UELE52	Internet of Things					
21UELE53	Mobile Technology					
Part III	Core Elective - II					
21UELE54	Power Electronics	5	5	25	75	100
21UELE55	PCB design and Fabrication					
21UELE56	Programmable Logic Controller					
Part IV	Skill Based Course					
21UELS51	Bio-Medical Instrumentation	2	2	25	75	100
	Total	30	26	205	495	700
SIXTH SEMESTER						
Part - III	Core Courses					
21UELC61	8051 Microcontroller and Embedded systems	6	5	25	75	100
21UELPR1	Project and Viva - Voce	6	4	25	75	100
21UELC67	8051 Microcontroller and Embedded Systems Lab	3	2	40	60	100
21UELC68	Sensors and Transducer Lab	3	2	40	60	100
Part III	Core Elective - I					
21UELE61	Satellite Communication	5	5	25	75	100
21UELE62	Digital Signal Processing					
21UELE63	Robotics					
Part III	Core Elective - II					
21UELE64	VLSI design	5	5	25	75	100
21UELE65	Modern Television Engineering					
21UELE66	Sensors and Measurements					
Part IV	Skill Based Course					
21UELS61	Computer Network	2	2	25	75	100
	Total	30	25	205	495	700
	Grand Total	180	140	1210	3090	4300

FIRST SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	SEMICONDUCTOR DEVICES				
Course Code	21UELC11	L	P	C	
Category	Core	5	-	5	
Nature of course:	EMPLOYABILITY	<input checked="" type="checkbox"/>	SKILL ORIENTED	ENTREPRENURSHIP	
Course Objectives:					
1. To introduce basic semiconductor devices, their characteristics and applications. 2. To understand analysis and design of simple diode circuits. 3. To learn the transistor working principles. 4. To explain the characteristics, working and applications of FET, UJT & Optoelectronic Devices 5. To implement electronic circuits based on the semiconducting devices.					
Unit: I	PN Junction Diode				15
Energy Band Structure and Conduction in Insulator - Semiconductor, Conductor - Intrinsic and Extrinsic Semiconductor – Doping – P Type – N Type Semiconductor - Formation of PN Junction Diode - Forward Bias - Reverse Bias Condition – Characteristics.					
Unit: II	Special Diodes				15
Zener Diode - VI Characteristics – Breakdown - Backward Diode – Varactor Diode - Step Recovery Diode - Point Contact Diode - Shcotteky Diode - Tunnel Diode - Gunn Diode – Impatt Diode - PIN Diode - PNP Diode.					
Unit: III	Bipolar Junction Transistor				15
Introduction To Bipolar Junction Transistor – Construction - Transistor Biasing - Operation of NPN and PNP Transistor - CB, CE &CC Configuration - Bias Stability - Load Line - Method of Biasing: Fixed Bias - Collector to Base Bias - Voltage Divider Bias – Bias Compensation – Thermal runaway-HeatSink.					
Unit: IV	FET and UJT				15
Introduction to FET - Construction and Operation of N-Channel JFET - Drain Characteristics- Comparison of JFET &BJT - Introduction to MOSFET - Enhancement MOSFET – Depletion MOSFET - FET as a Voltage Variable Resistor(VVR) - Introduction to UJT – Characteristics – UJT as a Relaxation Oscillator.					
Unit: V	Optoelectronic Devices				15
Principles, Operation And Characteristics of Optoelectronic Devices: LDR – Photo Diode - Photo Transistor – Photo Voltaic Cell – Solar Cell – Photo Emissive Sensors – Photo Multiplier – LED – IR Emitter – LCD – Optocouplers					
					Total Lecture Hours
					75Hrs
Books for Study:					
1. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, “ Electronics Devices And Circuits ”, Tata McGraw Hill Publishing Company Limited, New Delhi, 8th edition.					
2. B. L. Theraja, “ Basic Electronics – Solid State Devices ”, S.Chand&Company Ltd. 2000					
Books for References:					
1. V. K. Mehta, Principles of Electronics, S.Chand publications, Delhi, eleventh edition2000.					
2. R.S.Sedha, Applied Electronics , S.Chand& Company Ltd, New Delhi, first Edition, 1990					
Web Resources:					

1. https://nptel.ac.in/courses/108/108/108108122/	
2. https://nptel.ac.in/courses/108/108/108108112/	
3. https://nptel.ac.in/courses/115/102/115102103/	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Explain the structure of the basic Semiconductor Devices Up to K1
CO2:	Understand the characteristics, operations and application of Diodes and Special Diodes Up to K2
CO3:	Understand the characteristics and operations of Transistors Up to K3
CO4:	Understand the characteristics and operations of FET and UJT Up to K4
CO5:	Usage and working of Optoelectronic Devices. Up to K5

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	1	3	2
CO 2	1	1	1	1	2	3
CO 3	2	2	3	2	2	2
CO 4	2	1	1	1	2	3
CO5	1	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	PN Junction Diode Energy Band Structure and Conduction in Insulator - Semiconductor, Conductor - Intrinsic and Extrinsic Semiconductor – Doping – P Type – N Type Semiconductor - Formation of PN Junction Diode - Forward Bias - Reverse Bias Condition – Characteristics.	15	Chalk & Talk
II	Special Diodes Zener Diode - VI Characteristics – Breakdown - Backward Diode – Varactor Diode - Step Recovery Diode - Point Contact Diode - Schottky Diode - Tunnel Diode - Gunn Diode – Impatt Diode - PIN Diode - PNP Diode	15	Chalk & Talk
III	BJT Introduction To Bipolar Junction Transistor – Construction - Transistor Biasing - Operation of NPN and PNP Transistor - CB, CE & CC Configuration - Bias Stability - Load Line - Method of Biasing: Fixed Bias - Collector to Base Bias - Voltage Divider Bias – Bias Compensation – Thermal runaway-HeatSink.	15	Chalk & Talk
IV	FET and UJT Introduction to FET - Construction and Operation of N-Channel JFET - Drain Characteristics- Comparison of JFET & BJT - Introduction to MOSFET - Enhancement MOSFET – Depletion MOSFET - FET as a Voltage Variable Resistor(VVR) - Introduction to UJT – Characteristics – UJT as Relaxation Oscillator.	15	Power point presentation
V	OPTO ELECTRONIC DEVICES Principles, Operation And Characteristics Of Opto Electronic Devices: LDR – Photo Diode - Photo Transistor – Photo Voltaic Cell – Solar Cell – Photo Emissive Sensors – Photo Multiplier – LED – IR Emitter – LCD – Optocouplers.	15	Power point presentation

Course Designed by: **1. Mr. J. Charles Theodore**
2. Mr. A. Velmurugan

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K – Level	No. of Questions	K – Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1K3
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1K3
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1K4
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3&K3)	1K4
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	-	20	40	40
	K4	-	-	-	20	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	Cos	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	UP TO K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	K3	2	K1&K2	1	K1	2(K3&K3)	1(K3)
3	CO3	UP TO K4	2	K1&K2	1	K2	2(K2&K2)	1(K4)
4	CO4	UP TO K4	2	K1&K2	1	K2	2(K4&K4)	1(K3)
5	CO5	UP TO K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10	-	19	15.83	50
K2	5	6	20	10	41	34.16	
K3	-	-	10	30	40	33.33	33
K4	-	-	10	10	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K2	
18) b	CO3	K2	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K2	
20) b	CO5	K2	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONICS – I LAB			
Course Code	21UELCP1	L	P	C
Category	Core	-	4	2
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENURSHIP	
Course Objectives:				
1. To understand the fundamental principles of circuit theory and electronic devices. 2. To make use of circuit laws and theorems for measuring the circuit parameters. 3. To construct few applications using semiconductor devices. 4. To study the characteristics of transistor and diodes. 5. To learn the working of resonance circuits practically.				
List of Experiments (Any Ten)				
1. Verification of Ohm’s Law and Kirchhoff’s Laws. 2. Verification of Norton’s Theorem 3. Verification of Thevenin’s Theorem 4. Verification of Maximum Power Transfer Theorem 5. Verification of Superposition Theorem 6. Series Resonance Circuit 7. Parallel Resonance Circuit 8. V-I Characteristics of Junction Diode 9. V-I Characteristics of Zener Diode 10. Transistor Characteristics of CE Configuration 11. V-I Characteristics of JFET 12. V-I Characteristics of UJT 13. Characteristics of Solar Cell 14. Characteristics of optocoupler				
Web Resources:				
https://nptel.ac.in/courses/122/106/122106025/ https://nptel.ac.in/courses/122/106/122106026/				
Course Outcomes				K Level
On the successful completion of the course, student will be able to:				
CO1:	Apply the concept of basic circuit and theorems in practical circuits.	K3		
CO2:	Simplify the circuits using series and parallel equivalents and using Thevenin’s and Norton’s equivalent circuits practically.	K3		
CO3:	Construct resonance circuits.	K4		
CO4:	Experiment the fundamental operations of the main Semiconductor Electronic Devices	K3		
CO5:	Study and analyze the characteristics of transistor practically	K4		

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	1	2	1	3	2
CO 2	1	2	2	1	2	1
CO 3	2	1	3	1	1	2
CO 4	2	2	1	1	2	1
CO5	1	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Verification of Ohm’s Law and Kirchhoff’s Laws. Verification of Norton’s Theorem Verification of Thevenin’s Theorem	9	Practical
II	Verification of Maximum Power Transfer Theorem Verification of Superposition Theorem	9	Practical
III	Series Resonance Circuit Parallel Resonance Circuit V-I Characteristics of Junction Diode	9	Practical
IV	V-I Characteristics of Zener Diode Transistor Characteristics of CE Configuration V-I Characteristics of JFET V-I Characteristics of UJT	9	Practical
V	Characteristics of Solar Cell Characteristics of optocoupler	9	Practical

Course Designed by: **1. Mr. M. Satheeshkumar**
2. Mr. A. Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	BASIC ELECTRICITY AND CIRCUITS				
Course Code	21UELA11	L	P	C	
Category	Allied	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED ✓	ENTREPRENURSHIP		
Course Objectives:					
1. To become familiar with fundamentals of resistance and inductances 2. To learn to types and uses of capacitors. 3. To explain the basic concepts and laws of DC and AC electrical networks and solve them using mesh and nodal analysis. 4. To study the concepts of Electronic Circuit network theorems. 5. To understand the concepts of resonance circuits and filters.					
Unit: I	Resistors & Inductors				15
Resistors & Inductors					
Types of Resistors: Fixed, Variable - Brief mention of their Construction and Characteristics-Color Coding of Resistors - Connecting Resistors in Series and Parallel.					
Types of Inductors: Fixed, Variable- Self and Mutual Inductance-Faraday’s Law and Lenz’s Law of Electromagnetic Induction-Energy Stored in an Inductor-Inductance in Series and Parallel.					
Unit:II	Capacitors				15
Principles of Capacitance-Parallel Plate Capacitor-Permittivity-Definition of Dielectric Constant - Dielectric Strength-Energy Stored in a Capacitor-Types of Capacitors: Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic: Construction and Application- Connecting Capacitors in Series and Parallel - Factors Governing the Value of Capacitors.					
Unit: III	Electrical Elements and Circuits				15
Potential Difference- Electric Current-Electromotive Force - Ohms Law- Kirchoff’s Voltage Law - Kirchoff’s Current Law-Analysis of Resistance in Series Circuits, Parallel Circuits and Series Parallel Circuits-Concept of Voltage Source and Current Source-Voltage Source in Series and Current Source in Parallel.					
Unit: IV	Network Theorems				15
Star Delta Conversions (Only Theory) -Superposition Theorem – Thevenin’s Theorem- Norton’s Theorem – Simple Problems - Maximum Power Transfer Theorem (Only Theory) – Millmans Theorem (Only Theory)					
Unit: V	AC Circuits				15
Introduction To Sinusoidal Wave - RMS Value - Average Value - AC Circuits with Resistance - Circuits with XL Alone – Circuits with XC Alone - Series Reactance And Resistance - Parallel Reactance and Resistance - Series Parallel Reactance and Resistance – Real Power - Series Resonant Circuit – Parallel Resonant Circuit - Q Factor.					
Total Lecture Hours					75 Hrs
Books for Study:					
1. S.Salivahanan, N.Suresh Kumar, A.Vallavaraj“ Electronic Devices And Circuits ”-					
2. A.Sudhakar and ShyamMohan, Circuits and Networks Analysis and Synthesis , Tata MC Graw-Hill Publishing company LTD,NewDelhi,Third edition-2007					

Books for References:	
1. B.L.Theraja, “ Basic Electronics-Solid State Devices ”,S.Chand Company	
2. BernardGrob“ Basic Electronics ”-Tata McGraw-Hill Publishing Company Limited, 9thEdition.	
Web Resources:	
1. https://nptel.ac.in/courses/108/104/108104139/	
2. https://nptel.ac.in/courses/108/101/108101091/	
3. https://www.youtube.com/playlist?list=PLFF553CED56CDE25D	
4. https://www.youtube.com/watch?v=w8Dq8blTmSA	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Highlighting the working of resistors and inductors. Up to K2
CO2:	Summarize the working and types of capacitors. Up to K2
CO3:	Differentiate and demonstrate the voltage and current sources. Up to K3
CO4:	Apply the electronic components in network theorems. Up to K4
CO5:	Put into practice and use the electronic components Up to K5

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	1	3	2
CO 2	1	1	1	1	2	3
CO 3	2	2	3	2	2	2
CO 4	2	1	1	1	2	3
CO5	1	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	Course Name	Hrs	Pedagogy
I	Resistors & Inductors Types of Resistors: Fixed, Variable - Brief mention of their Construction and Characteristics- Color Coding of Resistors - Connecting Resistors in Series and Parallel. Types of Inductors: Fixed, Variable- Self and Mutual Inductance- Faraday's Law and Lenz's Law of Electromagnetic Induction-Energy Stored in an Inductor-Inductance in Series and Parallel.	15	Chalk & Talk
II	Capacitors Principles of Capacitance-Parallel Plate Capacitor-Permittivity-Definition of Dielectric Constant - Dielectric Strength-Energy Stored in a Capacitor-Types of Capacitors: Air, Paper, Mica, Teflon, Ceramic, Plastic and Electrolytic: Construction and Application- Connecting Capacitors in Series and Parallel - Factors Governing the Value of Capacitors.	15	Chalk & Talk
III	Electrical Elements and Circuits Potential Difference- Electric Current-Electromotive Force - Ohms Law- Kirchoff's Voltage Law - Kirchoff's Current Law-Analysis of Resistance in Series Circuits, Parallel Circuits and Series Parallel Circuits-Concept of Voltage Source and Current Source-Voltage Source in Series and Current Source in Parallel.	15	Chalk & Talk
IV	Star Delta Conversions (Only Theory) -Superposition Theorem – Thevenin's Theorem- Norton's Theorem – Simple Problems - Maximum Power Transfer Theorem (Only Theory) – Millmans Theorem (Only Theory)	15	Power point Presentation
V	AC Circuits Introduction To Sinusoidal Wave - RMS Value - Average Value - AC Circuits with Resistance - Circuits with XL Alone – Circuits with XC Alone - Series Reactance And Resistance - Parallel Reactance and Resistance - Series Parallel Reactance and Resistance – Real Power - Series Resonant Circuit – Parallel Resonant Circuit - Q Factor.	15	Power point Presentation

Course Designed by: **1. Mr. A. Velmurugan**
2. Mr. M. SatheeshKumar

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K – Level	No. of Questions	K - Level		
CI	CO1	UP TO K2	2	K1&K2	1	K2	2(K3&K3)	1(K3)
AI	CO2	UP TO K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CI	CO3	UP TO K4	2	K1&K2	1	K2	2(K3&K3)	1(K3)
AII	CO4	UP TO K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6			8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6			8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	Cos	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	UP TO K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
3	CO3	UP TO K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	UP TO K4	2	K1&K2	1	K2	2(K4&K4)	1(K3)
5	CO5	UP TO K3	2	K1&K2	1	K2	2(K2&K2)	1(K3)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10	-	19	15.83	50
K2	5	6	20	10	41	34.16	
K3	-	-	10	30	40	33.33	33
K4	-	-	10	10	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K2	
17) b	CO2	K2	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K2	
20) b	CO5	K2	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K3	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONIC INSTRUMENTATION				
Course Code	21UELS11	L	P	C	
Category	Skill	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED ✓	ENTREPRENURSHIP		
Course Objectives:					
1. To impart the knowledge on electronic instruments 2. To analyze and measurement the unknown R, L and C using bridge circuits. 3. To display the concept of CRO and signal generators for practical usage. 4. To understand the concept of power measurements. 5. To enable the students to acquire the knowledge of digital instruments and its applications in electronic circuits and know the technique of measurements using electronic instruments					
Unit: I	Indicating Instruments				06
DC Ammeter - DC Voltmeter- AC Voltmeter – Multirange Ammeter & Voltmeter - Series & Shunt Type Ohmmeter – Multimeter -Digital Multimeter.					
Unit: II	RLC Measurements				06
Wheatstone Bridge - Balance Equation of General AC Bridges - Maxwell - Schering - Wien - Kelvin bridge.					
Unit: III	Oscilloscope				06
Block diagram - CRT - Vertical Deflection System - Delay line - Horizontal Deflection System - CRT screens & Graticules - Oscilloscope Probes - Measurement of Frequency, Amplitude & Phase - Lissajou's Patterns- Digital storage oscilloscope.					
Unit: IV	Measurement of Power				06
Introduction- bolometer method of power measurement-Calorimeter method-Watt meter-Energy meter - Phase meter.					
Unit: V	Signal generation & signal analysis				06
Function Generator - Pulse Generator - Wave Analyzer - Harmonic Distortion Analyzer-Spectrum Analyzer					
					Total Lecture Hours
					30 Hrs
Books for Study:					
1. H.S. Kalsi (2002), Electronic Instrumentation, Tata McGraw-Hill Publishing Company Ltd., New Delhi. 2. A.K.Sahwney, Electrical and Electronic Measurements and Instrumentation. (2006), Dhanpat Rai & Co.(P) Ltd., New Delhi. 3. S.Salivahanan, N.Sureshkumar, A.Vallavaraj, Electronic Devices and Circuits - (1999), Tata McGraw-Hill Publishing Company Ltd, New Delhi.					
Books for References:					
1. Ramachandran, Measurements and Instruments, Priya Publishers, Trichy. 2. B.R.Gupta, Electronics and Instrumentation, (2003), S.Chand & Company Ltd, New Delhi, Third Edition, 2008. 3. V.A.Bakshi, A.V.Bakshi, Measurements and Instrumentation , Technical Publications, Pune, First Edition, 2008.					

Web Resources:	
http://nptel.ac.in/courses/108105064/ http://nptel.ac.in/courses/108105062/	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Define the working of electronic instruments. UP TO K2
CO2:	Summarize the concepts of RLC measurements using bridges UP TO K3
CO3:	Gain depth knowledge about the principles of oscilloscope UP TO K3
CO4:	Explain the knowledge about the power measurements. UP TO K4
CO5:	Put into practice and use the electronic Instruments UP TO K5

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	1	1
CO 3	3	3	3	2	2	2
CO 4	2	2	2	3	2	2
CO5	2	2	3	2	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	Course Name	Hrs	Pedagogy
I	Indicating Instruments DC Ammeter - DC Voltmeter- AC Voltmeter – Multirange Ammeter & Voltmeter - Series & Shunt Type Ohmmeter – Multimeter -Digital Multimeter.	6	Chalk & Talk
II	Bridges Wheatstone Bridge - Balance Equation of General AC Bridges - Maxwell - Schering - Wien - Kelvin bridge.	6	Chalk & Talk
III	Oscilloscope Block diagram - CRT - Vertical Deflection System - Delay line - Horizontal Deflection System - CRT screens & Graticules - Oscilloscope Probes - Measurement of Frequency, Amplitude & Phase - Lissajou's Patterns- Digital storage oscilloscope.	6	Chalk & Talk
IV	Measurement of power Introduction- bolometer method of power measurement-Calorimeter method-Watt meter-Energy meter - Phase meter.	6	Power point Presentation
V	SIGNAL GENERATION & SIGNAL ANALYSIS: Function Generator - Pulse Generator - Wave Analyzer - Harmonic Distortion Analyzer-Spectrum Analyzer	6	Power point Presentation

Course Designed by: **1. Mr. M. Satheeshkumar**
2. Mr. M. Velmurugan

SECOND SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONIC CIRCUITS				
Course Code	21UELC21	L	P	C	
Category	Core	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	ENTREPRENURSHIP		✓
Course Objectives:					
1. To highlight the students to gain knowledge on rectifiers and regulators. 2. To acquaint the students with construction, theory and characteristics of the electronic amplifier circuits. 3. To learn the working principles of power amplifier. 4. To understand the working principles of feedback amplifier. 5. To enable the students understand and gain the knowledge on oscillator and multivibrator					
Unit: I	Rectifiers and Regulators				15
Half wave, Full wave and bridge Rectifiers – Calculation of RMS Value – Average Value – Ripple Factor – Efficiency – Transformer Utility Factor – Peak Inverse Voltage – Clipper and Clamper types-Inductor Filter – Capacitor Filter – LC Filter – Pi Filter - Voltage Doubler – Voltage Regulator – Zener Diode as a Regulator – Transistor Shunt and Series Regulator – Overload Protection – Construction of DC Power Supply.					
Unit: II	Small Signal Amplifiers				15
Transistor as an Amplifier -Single Stage Transistor Amplifier – Frequency Response – Bandwidth – RC Coupled Amplifier -Transformer Coupled Amplifier – Tuned Amplifier – FET Amplifier.					
Unit: III	Power Amplifiers				15
Operation and Graphical Representation of Class A, Class B, Class C and Class AB Amplifiers – Maximum Collector Efficiency of Class A Power Amplifier – Class B Push Pull Amplifier – Crossover Distortion – Complementary Symmetry Push Pull Amplifier.					
Unit: IV	Feedback Amplifiers				15
Basic concepts of feedback – Positive Feedback – Negative Feedback – Effects of Negative Feedback on Gain, Bandwidth and Distortion – Noise – Voltage Series Feedback- Voltage Shunt Feedback – Current Series Feedback – Current Shunt Feedback.					
Unit: V	Oscillators And Multivibrators				15
Barkhausen Criterion – Hartley Oscillator – Colpitts Oscillator – Phase Shift Oscillator – Wein Bridge Oscillators –Peizo Electric Crystal and its Effects – Crystal Oscillator – AstableMultivibrator – MonostableMultivibrator – BistableMultivibrator – Schmitt Trigger.					
Total Lecture Hours					75Hrs
Books for Study:					
1. V.K Mehta, Rohit Mehta, Principles of Electronics ,S.Chand& Company Ltd, New Delhi, First Edition,1980.					
2. R.S.Sedha, Applied Electronics , S.Chand& Company Ltd, New Delhi, First Edition, 1990					
Books for References:					
1. S.Salivahanan, N. Sureskumar and A. Vallavaraj, Electronic Devices and Circuits , Tata McGraw-Hill Publishing Company Ltd, New Delhi, Second Edition, 2011					
2. B.L.Theraja, —Basic Electronicsl, Chand Company Ltd, 2000.					

Web Resources:	
1. http://www.ee.iitm.ac.in/~ani/2012/ec5135/lectures.html Lecture Notes	
2. https://nptel.ac.in/courses/108/102/108102097/#Introduction to Electronic circuits NPTEL.	
3. https://nptel.ac.in/courses/108/102/108102095/Analog Electronic circuits NPTEL.	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Understand the concepts of rectifiers and regulators UP TO K2
CO2:	Summarize about small signal amplifiers UP TO K3
CO3:	Analyse the functions of power amplifiers UP TO K3
CO4:	Distinguish the performance of negative as well as positive feedback circuits UP TO K4
CO5:	Design oscillators and multivibrators UP TO K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	1	1
CO 3	3	3	3	2	2	2
CO 4	2	2	2	3	2	2
CO5	2	2	3	1	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	Course Name	Hrs	Pedagogy
I	Rectifiers and Regulators Half wave, Full wave and bridge Rectifiers – Calculation of RMS Value – Average Value – Ripple Factor – Efficiency – Transformer Utility Factor – Peak Inverse Voltage – Clipper and Clamper types- Inductor Filter – Capacitor Filter – LC Filter – Pi Filter - Voltage Doubler – Voltage Regulator – Zener Diode as a Regulator – Transistor Shunt and Series Regulator – Overload Protection – Construction of DC Power Supply.	15	Chalk & Talk
II	Small Signal Amplifiers Transistor as an Amplifier -Single Stage Transistor Amplifier – Frequency Response – Bandwidth – RC Coupled Amplifier - Transformer Coupled Amplifier – Tuned Amplifier – FET Amplifier.	15	Chalk & Talk
III	Power Amplifiers Operation and Graphical Representation of Class A, Class B, Class C and Class AB Amplifiers – Maximum Collector Efficiency of Class A Power Amplifier – Class B Push Pull Amplifier – Crossover Distortion – Complementary Symmetry Push Pull Amplifier.	15	Chalk & Talk
IV	Feedback Amplifiers Basic concepts of feedback – Positive Feedback – Negative Feedback – Effects of Negative Feedback on Gain, Bandwidth and Distortion – Noise – Voltage Series Feedback- Voltage Shunt Feedback – Current Series Feedback – Current Shunt Feedback.	15	Power point Presentation
V	Oscillators And Multivibrators Barkhausen Criterion – Hartley Oscillator – Colpitts Oscillator – Phase Shift Oscillator – Wein Bridge Oscillators –Peizo Electric Crystal and its Effects – Crystal Oscillator –AstableMultivibrator – Monostablemultivibrator – BistableMultivibrator – Schmitt Trigger.	15	Power point Presentation

Course Designed by: **Mr. J. Charles Theodore**
Mr. A. Velmurugan

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K – Level	No. of Questions	K - Level		
CI	CO1	UP TO K2	2	K1&K2	1	K1	1(K3)	1(K4)
AI	CO2	UP TO K3	2	K1&K2	2	K2	1(K3)	1(K3)
CI	CO3	UP TO K4	2	K1&K2	1	K1	1(K3)	1(K3)
AII	CO4	UP TO K4	2	K1&K2	2	K2	1(K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		2	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2	-	-	4	8	50
	K2	2	4	-	-	6	12	
	K3	-	-	20	10	30	60	50
	K4	-	-	-	10	10	20	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2	-	-	4	8	50
	K2	2	4	-	-	6	12	
	K3	-	-	20	10	30	60	50
	K4	-	-	-	10	10	20	
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	Cos	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	UP TO K2	2	K1&K2	1	K1	2(K1&K1)	1(K2)
2	CO2	K3	2	K1&K2	1	K1	2(K2&K2)	1(K3)
3	CO3	UP TO K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	UP TO K4	2	K1&K2	1	K2	2(K4&K4)	1(K3)
5	CO5	UP TO K3	2	K1&K2	1	K2	2(K3&K3)	1(K2)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	4	10	-	219	15.83	50
K2	5	6	10	20	41	34.16	
K3	-	-	20	20	40	33.33	33
K4	-	-	10	10	20	16.67	17
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K1	
16) b	CO1	K1	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K4	
18) b	CO3	K4	
19) a	CO4	K3	
19) b	CO4	K3	
20) a	CO5	K2	
20) b	CO5	K2	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K4	
24	CO4	K3	
25	CO5	K2	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONICS – II LAB			
Course Code	21UELCP2	L	P	C
Category	Core	-	4	2
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	ENTREPRENURSHIP	✓
Course Objectives:				
1. To construct regulated power supplies practically. 2. To understand the working of rectifiers practically. 3. To design clipping and clamping circuits practically. 4. To analyse the working of amplifiers and oscillator practically. 5. To experiment the working of multivibrators using transistor.				
List of Experiment (Any Ten)				
1. Clippers and Clampers 2. DC Regulated Power Supply using Zener Diode 3. Dual power supply 4. IC Regulated Power Supply 5. Rectifier (Half & Full Wave) 6. Bridge Rectifier 7. Voltage Doubler 8. CE Amplifier. 9. Emitter Follower 10. Hartley Oscillator 11. Colpitts Oscillator 12. Wein Bridge Oscillator 13. Astable Multivibrators 14. Monostable Multivibrators 15. Bistable Multivibrator 16. Schmitt Trigger				
Web Resources:				
1. https://nptel.ac.in/courses/122/106/122106025/ 2. https://nptel.ac.in/courses/122/106/122106026/				
Course Outcomes				K Level
On the successful completion of the course, student will be able to:				
CO1:	Construct power supply and rectifier circuits practically.			K2
CO2:	Construct Amplifier circuits			K3
CO3:	Construct different Oscillator circuits			K3
CO4:	Construct different Multivibrator circuits using Transistor			K4
CO5:	Construct and Analyse various Electronics Circuits practically.			K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	1	2	1	3	2
CO 2	1	2	2	1	2	1
CO 3	2	1	3	1	1	2
CO 4	2	2	1	1	2	1
CO5	1	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Clippers and Clampers DC Regulated Power Supply using Zener Diode Dual power supply	9	Practical
II	Rectifier(Half and Full Wave) Bridge Rectifier IC Regulated Power Supply	9	Practical
III	CE Amplifier. Emitter Follower Voltage Doubler	9	Practical
IV	Hartley Oscillator Colpitts Oscillator Wein Bridge Oscillator	9	Practical
V	Astable Multivibrators Monostable Multivibrators Bistable Multivibrator Schmitt Trigger	9	Practical

Course Designed by: **1. Mr. M. Satheeshkumar**
Mr. A. Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	Probability and Statistics			
Course Code	21UMCA21	L	P	C
Category	Allied	5	-	4
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED ✓	ENTREPRENURSHIP	✓
Course Objectives:				
<ul style="list-style-type: none"> To provide students with the foundations of probabilistic and statistical analysis mostly used in varied applications in engineering and science like disease modeling, climate prediction and computer networks etc. To Apply laws of probability to concrete problems.. 				
Unit: I	Measures of Central Tendencies :	15		
Introduction – Arithmetic mean – Partition Values – Mode – Geometric Mean & Harmonic Mean(problems only)				
Unit: II	Measures of Dispersion	15		
Introduction – Measures of dispersion(problems only)				
Unit: III	Correlation and Regression	15		
Introduction – Correlation – Rank Correlation – Regression				
Unit: IV	Probability	15		
Probability- Introduction -Conditional Probability – Mathematical Expectations (Problems only)				
Unit: V	Special Distributions	15		
Introduction – Binomial Distribution – Poisson Distribution -Normal Distribution.(Problems only)				
Total Lecture Hours				75 Hrs
Books for Study:				
Arumugam. S. and Thangapandi Isaac. A., “ Statistics ”, New Gamma Publishing House, Palayamkotai, 2011.				
Unit I - Chapter 2: Sections : 2.0 – 2.4 Unit II - Chapter 3: Sections : 3.0 & 3.1(full) Unit III - Chapter 6: Sections: 6.0-6.3 Unit IV - Chapter11: Sections: 11.0-11.2, Chapter12 : Section: 12.4 Unit V - Chapter13: Sections: 13.0 – 13.3				
Books for Reference:				
1. Vittal. P.R., Mathematical Statistics , Margham Publications, Chennai, 2013. 2. Gupta. S.C. and Kapoor. V.K., “ Fundamentals of Mathematical Statistics ”, Eleventh edition, Sultan Chand & sons, New Delhi, 2007. 3. Gupta. S.C. and Kapoor. V.K., “ Elements of Mathematical Statistics ”, Third Edition, Sultan Chand & Sons, Educational Publishers, New Delhi, 2015.				
Web Resources:				
https://nptel.ac.in/courses/111/105/111105041/ https://www.classcentral.com/course/swayam-probability-and-statistics-5228				
Course Outcomes				K Level
On the successful completion of the course, the students will be able to				

CO1:	Improve data handling skills and summarize statistical computations.	K3
CO2:	Determine the relationship between quantitative variables and extend regression Analysis.	K3
CO3:	Recall and apply a comprehensive set of Probability ideas.	K1
CO4:	Find, interpret and analyze the measure of central tendencies, Moment Generating function and Characteristic function of random variables.	K3
CO5:	Relate, Analyze and Demonstrate the knowledge of using various distributions for statistical analysis.	K2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO6
CO 1	3	2	2	3	3	1
CO 2	3	3	3	3	2	1
CO 3	3	3	3	3	2	-
CO 4	3	2	2	3	3	1
CO 5	3	2	3	3	3	1

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction –Measures of Central Tendencies(Proofs of the Theorems are not included – Problems only)	15	Chalk & Board
II	Introduction – Measures of Dispersion (Proofs of the Theorems are not included – Problems only)	15	Chalk & Board
III	Introduction – Correlation – Rank Correlation – Regression. Introduction-	15	Chalk & Board
IV	Probability- Conditional Probability – Mathematical Expectations (Proofs of the Theorems are not included – Problems only)	15	Chalk & Board
V	Introduction – Binomial Distribution – Poisson Distribution -Normal Distribution.(Proofs of the Theorems are not included – Problems only)	15	Chalk & Board

Course Designed by: **Mrs. H. Sowmiyagowri**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Question s	K - Level	No. of Questio ns	K – Level		
CI	CO1	Up to K2	2	K1,K2	1	K1	2(K2&K2)	1 K2
AI	CO2	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 (K3)
CI	CO3	Up to K3	2	K1,K2	1	K1	2(K2&K2)	1 (K2)
AII	CO4	Up to K3	2	K1,K2	2	K2	2(K3&K3)	1 (K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

*Note: It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2	-	-	4	8	60
	K2	2	4	10	10	26	52	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	-	-	-	-
	K5	-	-	-	--	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2	-	-	4	8	60
	K2	2	4	10	10	26	52	
	K3	-	-	10	10	20	40	40
	K4	-	-	-	-	-	-	-
	K5	-	-	-	--	-	-	-
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO 1	K1	2	K1	1	K1	2 (K3& K3)	1 (K2)
2	CO 2	K3	2	K1	1	K1	2 (K3 &K3)	1 (K3)
3	CO 3	K3	2	K1&K2	1	K2	2 (K3 &K4)	1 (K3)
4	CO 4	K4	2	K1&K2	1	K2	2 (K3 &K4)	1 (K3)
5	CO 5	K4	2	K1&K2	1	K2	2 (K3 &K4)	1 (K4)
No. of Questions to be Asked			10		5		5	5
No.of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	6	10	-	19	15.83	42
K2	5	4	10	10	31	25.83	
K3	-	-	20	30	50	41.67	42
K4	-	-	10	10	20	16.67	16
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K1	
12	CO2	K1	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K4	
18) b	CO3	K4	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K2	
22	CO2	K3	
23	CO3	K3	
24	CO4	K3	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONIC COMMUNICATION SYSTEMS				
Course Code	21UELS21	L	P	C	
Category	Skill	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED ✓	ENTREPRENURSHIP		
Course Objectives:					
<ol style="list-style-type: none"> 1. To define the concept of Analog communication system 2. To understand the concept of digital communication system 3. To acquire knowledge on Amplitude and Frequency modulation. 4. To inculcate the principle of mobile communication& satellite communication 5. To compare and contrast the communication systems by self-study. 					
Unit: I	Introduction:				06
Introduction to communication- Elements of a communication system- -need for modulation- Electromagnetic spectrum and typical applications-some communication systems- classification of communication systems.					
Unit: II	Analog Communication:				06
Introduction-Amplitude modulation-Angle modulation-Frequency modulation-Transmitter and receiver of AM and FM.					
Unit: III	Digital Communication:				06
Digital pulse modulation-PCM-Sampling-Quantizing-coding-delta modulation-wireless communication.					
Unit: IV	Mobile Communication:				06
Introduction: Cell Mobile Telephone system – Group of special mobile (GSM) – Multiple access techniques (TDMA, FDMA, CDMA) –GPRS- Introduction to Mobile Communication Spectrum.					
Unit: V	Satellite Communication:				06
Introduction – Active and passive satellite- structure of satellite communication-satellite orbits- Application-Attitude and orbit control system-TT&C-communication subsystems.					
Total Lecture Hours					30Hrs
Books for Study:					
<ol style="list-style-type: none"> 1. Simon Haykin, Communications Systems, Wiley India, New Delhi, 4th Edition, Reprint. 2007. 2. K.S.Srinivasan, Principles of Communication System, Anuradha Publications, New Delhi, First Edition, Reprint 2007.. 3. MonojitMitra, Satellite Communication, Prentice Hall of India, New Delhi, First Edition, 2005. 					
Books for References:					
<ol style="list-style-type: none"> 1. Simon Haykin, Analog and Digital Communications, Wiley India, New Delhi, 1st Edition, Reprint. 2003 2. B.P.Lathi, Communication Systems, Wiley Eastern University Edition, USA, First Edition Reprint 1994. 3. B.P.Lathi, Modern Digital and Analog Communication Systems, Prism Books Private Ltd, Newyork, Second Edition, 1993. 					

Web Resources:		
1. https://swayam.gov.in/nd1_noc20_ee16/preview		
2. https://swayam.gov.in/nd1_noc19_ee47/preview		
Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Describe the basic building blocks of communication systems	UP TO K1
CO2:	Summarize the basic concept of communications.	UP TO K2
CO3:	Apply the modulation and demodulation concepts in communication systems.	UP TO K3
CO4:	Distinguish the operation of AM and FM modulation	UP TO K4
CO5:	Compare and contrast the types of communication systems.	UP TO K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	1	1
CO 3	3	3	3	2	2	2
CO 4	2	2	2	3	2	2
CO5	2	2	3	2	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	Course Name	Hrs	Pedagogy
I	Introduction: Introduction to communication- Elements of a communication system- -need for modulation- Electromagnetic spectrum and typical applications-some communication systems- classification of communication systems.	6	Chalk & Talk
II	Analog communication: Introduction-Amplitude modulation-Angle modulation-Frequency modulation-Transmitter and receiver of AM and FM	6	Chalk & Talk
III	Digital communication: Digital pulse modulation-PCM-Sampling-Quantizing-coding-delta modulation-wireless communication	6	Chalk & Talk
IV	Mobile Communication: Introduction: Cell Mobile Telephone system – Group of special mobile (GSM) – Multiple access techniques (TDMA, FDMA, CDMA-GPRS- Introduction to Mobile Communication Spectrum.	6	Power point Presentation
V	Satellite communication: Introduction – Active and passive satellite- structure of satellite communication-satellite orbits-Application-Attitude and orbit control system-TT&C-communication subsystems.	6	Power point Presentation

Course Designed by: **Mr.M. Satheeshkumar**

Mr. A. Velmurugan

THIRD SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	DIGITAL ELECTRONICS			
Course Code	21UELC31	L	P	C
Category	Core	5	-	5
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPRENEURSHIP
Course Objectives:				
1. To acquire the basic knowledge of Number systems and arithmetic operation. 2. To outline the formal procedures for the analysis and design of Boolean algebra and logic circuits 3. To learn the concepts of arithmetic and combinational logic circuits. 4. To understand the working principles of shift registers and Flip-flops 5. To learn the concepts of A/D, D/A conversions and their types.				
Unit: I	Number System and Codes			15
Number System: Decimal, Binary, Octal and Hexa Decimal Number Systems –Conversion from One Number System to Another Number System – Floating Point Representation. Arithmetic Operation: Binary Addition, Subtraction, Multiplication and Division – 1’s and 2’s Compliments Representation- 2’s Complement Arithmetic - Binary Coded Decimal (BCD) – Excess Three Code – Gray Code – ASCII Codes.				
Unit: II	Boolean Algebra And Logic Gates			15
Boolean Logic Operation – basic laws of Boolean algebra – De Morgan’s Theorem – Sum of Product method and Product of Sum method– Karnaugh map. Logic Gates : OR, AND, NOT, NAND, NOR – Universal Gates- EX-OR and EX-NOR Gates - Logic Gates using Discrete Components.				
Unit: III	Arithmetic and Combinational Logic Circuits			15
Half Adder – Full Adder – Half Subtractor – Full Subtractor – Parallel Binary Adder – 4 bit Binary Adder / Subtractor – BCD adder – Multiplexer – Demultiplexer – Decoders – Encoders– Parity Generators / Checkers – Magnitude Comparators.				
Unit: IV	Sequential Logic Circuits			15
Flip Flops: R-S Flip flop - Clocked R-S Flip flop - D Flip flop – J-K Flip flop –Master Slave J-K Flip Flops - T Flip Flops. Shift Registers and Counters: SISO - SIPO – PIPO – PISO - Ring Counters – Ripple Counters – Synchronous Counter – Up Down counter– Mod-3, Mod-5 Counters-Mod-10 counters.				
Unit: V	D/A and A/D Converters			15
Simultaneous Type (Flash type) of ADC- Successive Approximation Type of ADC - Dual Slope Type of ADC - Binary weighted Resistor type of DAC - R-2R Ladder Type of DAC - Implementation using ADC 0809 & DAC 0800 IC's.				
Total Lecture Hours				75 Hrs
Books for Study:				
1. Salivahanan.S and Arivazhagan.S, DIGITAL CIRCUITS AND DESIGN , Vikas Publication				

House Private Ltd, Noida, 3 rd edition, 2009.	
2. Malvino & Leech, — DIGITAL PRINCIPLES AND APPLICATIONS l, Tata McGraw Hill Edition V, 2002	
Books for References:	
1. M.Morris Mano — Digital Logic and Computer Design PHI 2005	
2. M.Morris Mano — Digital Design PHI, Third edition 2005.	
3. Thomas L Floyd - Digital Fundamentals 11 th edition, Pearson publications	
Web Resources:	
1. https://nptel.ac.in/courses/117/106/117106086/	
2. https://nptel.ac.in/courses/117/106/117106086/	
3. https://nptel.ac.in/courses/108/105/108105132/	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Understand the basics of Number systems and codes Up to K3
CO2:	Realize the operation of various logic gates and analyzing the outputs Up to K3
CO3:	Analyze and design the Arithmetic and combinational logic circuits Up to K4
CO4:	Analyze and design the Sequential logic circuits Up to K4
CO5:	Understand the basics of analog-to- digital converter and digital –to –analog converter Up to K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	3	2
CO 2	2	1	2	2	2	3
CO 3	2	2	3	2	2	2
CO 4	2	1	1	1	3	1
CO 5	1	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Number System: Decimal, Binary, Octal and Hexa Decimal Number Systems – Conversion from One Number System to Another Number System – Floating Point Representation. Arithmetic Operation: Binary Addition, Subtraction, Multiplication and Division – 1’s and 2’s Compliments Representation- 2’s Compliment Arithmetic - Binary Coded Decimal (BCD) – Excess Three Code – Gray Code – ASCII Codes.	15	Chalk & Talk
II	Boolean Logic Operation – basic laws of Boolean algebra – De Morgan’s Theorem – Sum of Product method and Product of Sum method– Karnaugh map. Logic Gates : OR, AND, NOT, NAND, NOR – Universal Gates- EX-OR and EX-NOR Gates - Logic Gates using Discrete Components.	15	Chalk & Talk
III	Half Adder – Full Adder – Half Subtractor – Full Subtractor – Parallel Binary Adder – 4 bit Binary Adder / Subtractor – BCD adder – Multiplexer – Demultiplexer – Decoders – Encoders– Parity Generators / Checkers – Magnitude Comparators.	15	Chalk & Talk
IV	Flip Flops: R-S Flip flop - Clocked R-S Flip flop - D Flip flop – J-K Flip flop –Master Slave J-K Flip Flops - T Flip Flops. Shift Registers and Counters: SISO - SIPO – PIPO – PISO - Ring Counters – Ripple Counters – Synchronous Counter – Up Down counter– Mod-3, Mod-5 CountersMod-10 counters.	15	Power point presentation
V	Simultaneous Type (Flash type) of ADC- Successive Approximation Type of ADC - Dual Slope Type of ADC - Binary weighted Resistor type of DAC - R-2R Ladder Type of DAC - Implementation using ADC 0809 & DAC 0800 IC's.	15	Power point presentation

Course Designed by:

1. Mr. Charles Theodore & 2. Mr.A.Velmurugan, Assistant Professor

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	COs	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1K3
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1K3
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1K4
AII	CO4	Up to K4	2	K1&K2	2	K2	2(K3&K3)	1K4
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	-	20	40	40
	K4	-	-	-	20	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered.			10		5		5	3
Marks for each question.			1		2		5	10
Total Marks for each section.			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	DIGITAL ELECTRONICS LAB			
Course Code	21UELCP3	L	P	C
Category	Core	-	4	2
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPRENEURSHIP
Course Objectives:				
1. To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits. 2. To prepare students to perform the analysis and design of various digital electronic circuits 3. Students will learn and understand basis of digital electronics and able to design combinational and sequential circuits. 4. To prepare students to perform the analysis and design of registers and counters 5. To develop digital –to- analog convertor circuit using R-2R ladder method.				
List of Experiment (Any 12 experiments) 1. Study of basic gates using ICs and discrete components. 2. Study of Universal gates (NOR and NAND) 3. Study the Boolean laws and DE Morgan's Theorem 4. Half Adder and Full Adder. 5. Half Subtractor and Full Subtractor 6. Binary to Gray Converter and Gray to Binary Converter. 7. RS flip-flop and Clocked- RS using NAND and NOR gates. 8. D-flipflop and T Flip flop. 9. JK flip-flop 10. Multiplexer 11. De- Multiplexer. 12. Octal to Binary Encoder 13. BCD to seven Segment Decoder 14. Shift Register-SISO 15. BCD counter 16. Analog to Digital converter using IC0804				
Web Resources:				
http://vlabs.iitb.ac.in/vlabs-dev/labs/digital-electronics/ https://nptel.ac.in/courses/108/105/108105132/				
Course Outcomes				K Level
On the successful completion of the course, student will be able to:				
CO1:	To make use of logic circuits using Boolean laws.	K4		
CO2:	To construct logic gates using digital IC's and discrete components.	K5		
CO3:	To make use of arithmetic and combinational circuits using logic gates.	K5		
CO4:	To construct Flip-flop circuits using digital IC's.	K5		
CO5:	To construct Shift registers and counters using digital IC's.	K5		

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	3	3
CO 2	3	2	2	2	3	3
CO 3	3	3	3	2	3	2
CO 4	2	2	2	3	2	3
CO 5	2	2	3	3	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Study of basic gates using ICs and discrete components. Study of Universal gates (NOR and NAND) Study the Boolean laws and DeMorgan's Theorem	9	Practical
II	Half Adder and Full Adder. Half Subtractor and Full Subtractor Binary to Gray Converter and Gray to Binary Converter.	9	Practical
III	RS flip-flop and Clocked- RS using NAND and NOR gates. D-flip-flop, T Flip flop and JK flip-flop	9	Practical
IV	Multiplexer, De- Multiplexer and Octal to Binary Encoder	9	Practical
V	BCD to seven Segment Decoder, Shift Register and BCD counter	9	Practical

Course Designed by: **1. Mr. Charles Theodore**

2. Mr.A.Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	PROGRAMMING IN C			
Course Code	21UITA31	L	P	C
Category	Allied	5	-	5
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:				
<ul style="list-style-type: none"> To learn the fundamentals of C programming concepts. To develop C programs using arrays and strings. To develop applications in C using functions pointers and structures. To implement Structures and Unions Concepts of C. To do input/output in file handling in C. 				
Unit: I	C Programming Basics			15 Hours
Structure of C program – C programming: Data Types – Constants– Keywords — Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements — Decision making statements – Switch statement – Looping statements.				
Unit: II	Arrays and Strings :			15 Hours
Arrays– Declaration– Initialization – One Dimensional and Two Dimensional Arrays – Multidimensional Array - Strings: Implementing String Variables – String operations: length, compare, concatenate, copy				
Unit: III	Functions and Pointers :			15 Hours
Introduction - Function prototype, function definition, function call, Built-in functions — Recursion & Non Recursion Function— Pointers: Types of Pointers-Pointer Expression- - Pointers and Functions.				
Unit: IV	Structures and Unions			15 Hours
Structure – Nested structures - Array of structures - Self referential structures — Dynamic memory allocation – Introduction of Unions - Difference between Structure and Unions				
Unit: V	File Handling			15 Hours
Introduction - Opening and Closing File - Input / Output operations on File - Random Access to Files - Command Line Arguments.				
Total Lecture Hours				75 Hours
Books for Study:				
1. E.Balagurusamy, Programming in ANSI C, Tata McGraw Hill Education Private Limited, Sixth Edition, New Delhi, 2012.				
2. R.G. Dromey, “How to solve it by Computer”, Pearson Education, 2008.				
Books for References:				
1. Hanly J R &Koffman E.B, “Problem Solving and Programm design in C”, PearsonEducation, 2009.				
2. Yashavant Kanetkar, Let Us C, BPB Publications, New Delhi, Tenth Edition, 2010.				
3. Byron Gottfried, Programming with C, McGraw Hill Education (India) Private Limited, New Delhi, Third Edition, 2014.				
4. Brain W.Kernigham & Dennis Ritchie, C Programming, Prentice Hall, Second Edition, 1988.				

Web Resources:	
1. https://www.slideshare.net/AjitNavak20/computer-fundamentals-intro-to-c-programming-module-i	
2. https://www.slideshare.net/avikdhupar/amazing-c	
3. https://www.guru99.com/c-programming-tutorial.html	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Demonstrate an understanding of C programming language concepts K3
CO2:	Develop and implement applications in C using arrays and strings K3
CO3:	Design and develop programs, analyses and interprets the concept of functions and pointers. K3
CO4:	Develop applications in C using structures and Unions K4
CO5:	Relate the concepts of programming and develop confidence to learn the C language for life time K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	1	2	2	1	2	3
CO 2	2	2	3	2	3	1
CO 3	3	2	2	3	2	2
CO 4	2	2	3	3	3	2
CO 5	2	3	2	2	3	1

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	SUBJECT NAME	Hrs	Mode
I	Structure of C program – C programming: Data Types – Constants– Keywords — Operators: Precedence and Associativity – Expressions – Input/Output statements, Assignment statements — Decision making statements – Switch statement – Looping statements.	15	Chalk & Talk, ICT Kit
II	Arrays– Declaration– Initialization – One Dimensional and Two Dimensional Arrays – Multidimensional Array - Strings: Implementing String Variables – String operations: length, compare, concatenate, copy	15	Chalk & Talk, ICT Kit
III	Introduction - Function prototype, function definition, function call, Built-in functions — Recursion & Non Recursion Function— Pointers: Types of Pointers-Pointer Expression- - Pointers and Functions	15	Chalk & Talk, ICT Kit
IV	Structure – Nested structures - Array of structures - Self referential structures — Dynamic memory allocation – Introduction of Unions - Difference between Structure and Unions	15	Chalk & Talk, ICT Kit
V	Introduction - Opening and Closing File - Input / Output operations on File - Random Access to Files - Command Line Arguments	15	Chalk & Talk, ICT Kit

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K – Level		
CI AI	CO1	Up to K3	2	K1,K2	1	K2	2(K3,K3)	1(K3)
	CO2	Up to K3	2	K1,K2	2	K2	2(K3,K3)	1(K3)
CI AII	CO3	Up to K3	2	K1,K2	1	K2	2(K3,K3)	1(K3)
	CO4	Up to K4	2	K1,K2	2	K2	2(K4,K4)	1(K4)
Question Pattern CIA I & II	No. of Questions to be asked		4		3		4	2
	No. of Questions to be answered		4		3		2	1
	Marks for each question		1		2		5	10
	Total Marks for each section		4		6		10	10

***Note:** It is the decision of the course teacher to ask 2 Questions in any unit under section-B (short answer questions)

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	2	-	-	4	8	20
	K2	2	4	-	-	6	12	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	2	-	-	4	8	20
	K2	2	4	-	-	6	12	
	K3	-	-	10	10	20	40	40
	K4	-	-	10	10	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MOQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	UP TO K3	2	K1,K2	1	K2	2(K3,K3)	1(K3)
2	CO2	UP TO K3	2	K1,K2	1	K2	2(K3,K3)	1(K3)
3	CO3	UP TO K3	2	K1,K2	1	K2	2(K3,K3)	1(K3)
4	CO4	UP TO K4	2	K1,K2	1	K2	2(K4,K4)	1(K4)
5	CO5	UP TO K4	2	K1,K2	1	K2	2(K4,K4)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.17	17
K2	5	10	-	-	15	12.5	
K3	-	-	30	30	60	50	50
K4	-	-	20	20	40	33.33	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K4	
20) b	CO5	K4	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K3	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	COMPUTER ORIENTED OFFICE AUTOMATION				
Course Code	21UELS31	L	P	C	
Category	Skill	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> 1. To learn about the basis of computer and its application. 2. To develop skills on the Microsoft word. 3. To develop skills on the Microsoft Excel. 4. To develop skills on the Microsoft power point. 5. To develop skills on the Microsoft Access. 					
Unit: I	Basics Of Computer				06
Introduction- Software and Hardware Components – Hardware Accessories - Operating System Software - Software Applications - Computer Network: LAN - Internet - E-Mail – Browsers- E-Mail – Clients.					
Unit: II	MS Word				06
Setting Page Style - Formatting - Border & Shading – Columns - Header & Foot- Setting Footnotes - Inserting Manual Page Break - Column Break and Line Break – Creating Sections and Frames Inserting. Clip Arts, Pictures, and Other Files-Anchoring& Wrapping Setting Document Styles - Table of Contents - Index - Page Numbering, Data And Time, Author, Etc., - Creating Master Documents -Web Page.					
Unit: III	MS Excel				06
Creating Worksheet - Entering and Editing Text, Numbers, Formulas - Saving – Excel Functions Modifying Worksheet Range Selection Copying and Moving Data - Defining Names - Inserting and Deleting Rows of Columns - Moving Around Worksheet Naming Worksheet, Copying Inserting and Deleting Worksheet - Formatting, Gauging, Heading Displaying Value - Changing of Selecting Fonts - Protesting Data Using Style So Templates - Reprinting Worksheet Creating Charts - Managing Date - Tables- Tables Wraps – Macros - Linking Worksheets					
Unit: IV	MS Power Point				06
Creating a Presentation: Setting Presentation Style - Adding Text to the Presentation - Formatting a Presentation: Adding Style - Color, Gradient Fills - Arranging Objects – Adding Header & Footer - Slide Background - Slide Layout - Adding Graphics to the Presentation: Inserting Pictures, Movies, Tables, Etc. Into the Presentation – Drawing Pictures Using Draw - Adding Effects to the Presentation: Setting Animation & Transition Effect - Adding Audio and Video.					
Unit: V	MS Access				06
Introduction: Database Concepts - Tables - Queries - Forms – Reports. Opening & Saving Database Files: Creating Table Design - Indexing - Entering Data – Importing Data- Creating Queries: SQL Statements - Setting Relationship - Using Wizards - Creating Forms: GUI - Form Creating & Printing Report.					
					Total Lecture Hours
					30 Hrs
Books for Study:					
1. Step by Step 2007 Microsoft Office System (W/CD) by Curtis Frye, Joyce Cox, Steve					

Lambert	
2. Microsoft Office Word 2007 Plain & Simple by Jerry Joyce & Marianne Moon	
Books for References:	
1. The Unofficial Guide to Microsoft Office Excel 2007 Julia Kelly & Curt Simmons	
2. Microsoft Office Power point 2007 Plain & Simple Nancy Muir	
Web Resources:	
https://www.msuniv.ac.in/images/e-content/6.Computer%20Fundamentals%20and%20Office%20Automation.pdf	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Recognize and understand Basics of Computer Up to K2
CO2:	Use and Practice of Word Processing Up to K2
CO3:	Use and Practice of MS Excel Up to K2
CO4:	Knowledge to Make Small Presentation Up to K2
CO5:	Use and Practice of MS Access Up to K2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	1
CO 3	3	3	2	3	2	2
CO 4	2	2	3	2	3	2
CO 5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Basics Of Computer: Introduction- Software and Hardware Components – Hardware Accessories - Operating System Software - Software Applications - Computer Network: LAN - Internet - E-Mail – Browsers- E-Mail – Clients.	6	Chalk & Talk
II	MS Word : Setting Page Style - Formatting - Border & Shading – Columns - Header & Foot- Setting Footnotes - Inserting Manual Page Break - Column Break and Line Break – Creating Sections and Frames Inserting. Clip Arts, Pictures, and Other Files-Anchoring& Wrapping Setting Document Styles - Table of Contents - Index - Page Numbering, Data And Time, Author, Etc., - Creating Master Documents -Web Page.	6	Power point presentation
III	MS Excel : Creating Worksheet - Entering and Editing Text, Numbers, Formulas - Saving – Excel Functions Modifying Worksheet Range Selection Copying and Moving Data - Defining Names - Inserting and Deleting Rows of Columns - Moving Around Worksheet Naming Worksheet, Copying Inserting and Deleting Worksheet - Formatting, Gauging, Heading Displaying Value - Changing of Selecting Fonts - Protecting Data Using Style So Templates - Reprinting Worksheet Creating Charts - Managing Date - Tables- Tables Wraps – Macros - Linking Worksheets	6	Power point presentation
IV	MS Power Point: Creating a Presentation: Setting Presentation Style - Adding Text to the Presentation - Formatting a Presentation: Adding Style - Color, Gradient Fills - Arranging Objects – Adding Header & Footer - Slide Background - Slide Layout - Adding Graphics to the Presentation: Inserting Pictures, Movies, Tables, Etc. Into the Presentation – Drawing Pictures Using Draw - Adding Effects to the Presentation: Setting Animation & Transition Effect - Adding Audio and Video.	6	Power point presentation
V	MS Access: Introduction: Database Concepts - Tables - Queries - Forms – Reports. Opening & Saving Database Files: Creating Table Design - Indexing - Entering Data – Importing Data- Creating Queries: SQL Statements - Setting Relationship - Using Wizards - Creating Forms: GUI - Form Creating & Printing Report.	6	Power point presentation

Course Designed by: **1. Mr. M. Satheesh Kumar**
2. Mr.M. Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	BASIC ELECTRONICS				
Course Code	21UELN31	L	P	C	
Category	Non-Major Elective	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> 1. To acquire the basic knowledge of electronic components 2. To understand the function and uses of semiconductor. 3. To understand the working function of the power supply 4. To learn the uses of Electronic instruments and optical devices. 5. To acquire the basic knowledge of digital electronics. 					
Unit: I	ELECTRONIC COMPONENTS				06
Simple Theory & Use of : Resistors, Capacitors, Inductors, Diodes, Zener diodes, Transistors, Seven Segment Display, Transformers, Switches, Microphone, Loudspeaker, Buzzers, Fuse.					
Unit: II	SEMICONDUCTOR THEORY :				06
Conductor- Semiconductor- Intrinsic Semiconductor- Extrinsic semiconductor- P type Semiconductor and N type Semiconductor- PN junction diode - V-I characteristics of PN junction diode					
Unit: III	POWER SUPPLY				06
Bridge Rectifier - Capacitor Filter - Fixed IC Regulated Power Supply – SMPS – UPS-Inverter – Constant Voltage Transformer.					
Unit: IV	ELECTRONIC INSTRUMENTS AND OPTICAL DEVICES				06
Multimeter-Application of multimeter- Merits and Demerits of multimeters					
Simple Theory & Use of: LED, Laser, Solar Cell, LDR, LCD display					
Unit: V	DIGITAL ELECTRONICS				06
Number System: Decimal, Binary– Decimal to Binary Conversion – Binary to Decimal conversion -Signed binary numbers.					
Logic Gates: Basic Operation of OR, AND, NOT, NOR, NAND, Ex-OR and Ex-NOR.					
Total Lecture Hours					30 Hrs
Books for Study:					
<ol style="list-style-type: none"> 1. V. K. Mehta, Principles of Electronics – – Chand publications, New Delhi – 12th Edition 2. R.S.Sedha, Applied Electronics, S.Chand& Company Ltd, New Delhi, first Edition, 1990 					
Books for References:					
<ol style="list-style-type: none"> 3. S. Salivahanan, N. Suresh Kumar, A. Vallavaraj, “Electronics Devices and Circuits”, Tata McGraw Hill Publishing Company Limited, New Delhi, 8th edition. 4. B. L. Theraja, “Basic Electronics – Solid State Devices”, S.Chand&CompanyLtd. 2000 					
Web Resources:					
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/108/108/108108122/ 2. https://nptel.ac.in/courses/108/108/108108112/ 3. https://nptel.ac.in/courses/115/102/115102103/ 					
Course Outcomes					K Level
On the successful completion of the course, student will be able to:					

CO1:	Understand the theory basics of electronic components.	Up to K2
CO2:	Understand the simple theory and use of semiconductor.	Up to K2
CO3:	Utilization of electronic components in power supply circuits.	Up to K2
CO4:	Utilization of Electronic instruments and optical devices.	Up to K2
CO5:	Gain the knowledge about digital electronics	Up to K2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	2	2	2
CO 2	2	3	1	2	2	3
CO 3	1	2	2	1	1	2
CO 4	3	2	2	2	1	2
CO 5	2	1	2	3	2	1

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Simple Theory & Use of : Resistors, Capacitors, Inductors, Diodes, Zener diodes, Transistors, Seven Segment Display, Transformers, Switches, Microphone, Loudspeaker, Buzzers, Fuse.	6	Chalk & Talk
II	Conductor- Semiconductor- Intrinsic Semiconductor- Extrinsic semiconductor- P type Semiconductor and N type Semiconductor- PN junction diode - V-I characteristics of PN junction diode	6	Chalk & Talk
III	Bridge Rectifier - Capacitor Filter - Fixed IC Regulated Power Supply – SMPS – UPS-Inverter –Constant Voltage Transformer	6	Chalk & Talk
IV	Multimeter-Application of multimeter- Merits and Demerits of multimeters Simple Theory & Use of: LED, Laser, Solar Cell, LDR, LCD display	6	Power point presentation
V	Number System: Decimal, Binary– Decimal to Binary Conversion – Binary to Decimal conversion -Signed binary numbers. Logic Gates: Basic Operation of OR, AND, NOT, NOR, NAND, Ex-OR and Ex-NOR.	6	Power point presentation

Course Designed by: **1. Mr. M. Satheesh Kumar & Mr. A.Velmurugan**

FOURTH SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	LINEAR INTEGRATED CIRCUITS				
Course Code	21UELC41	L	P	C	
Category	Core	5	-	5	
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:					
1. To impart the knowledge on Op-amp Characteristics. 2. To Gain the knowledge about the linear applications of an Op-amp 3. To understand the knowledge about the nonlinear applications of an Op-amp 4. To enable the students to acquire the knowledge of regulators and generators 5. To enable the students to acquire the knowledge of special functions of ICs (555,565 and 566) in various circuits.					
Unit: I	Operational Amplifier				15
Basic information of Op-amp - Functional Block diagram –Characteristics of an ideal Operational Amplifier – Circuit Schematic of Op Amp 741. Operational Amplifier Characteristics: Open loop gain – CMRR – Input bias and offset currents – Input and output offset voltages – Offset compensation techniques – Frequency response characteristics – Stability – Limitation – Frequency compensation – Slew rate					
Unit: II	Linear Application of Operational Amplifier				15
Inverting and Non-inverting amplifiers – Voltage follower – Summing amplifier - Differential amplifier – Instrumentation amplifier – Integrator and Differentiator – Voltage to Current converter-Current to voltage converter- High pass-Low pass- Band Stop Filter- Butter worth filters – Narrow band pass Filter.					
Unit: III	Non Linear Application of Operational Amplifier				15
Comparators – Regenerative comparator – Zero crossing detector – Sample and Hold circuit – Precision diode – Half wave precision rectifiers – Active peak detector -Clipper and Clamper – Logarithm and Exponential amplifier					
Unit: IV	Wave form Generators and IC voltage regulators				15
Waveform generator: Square wave generator-Triangular wave generator- Sine wave generator IC Voltage Regulator: Block diagram of 723 general Purpose of voltage regulator – Dual power supply – Current limiting schemes. Output current boosting – Fixed and adjustable three terminal regulator.					
Unit: V	Special Functions ICs				15
555 Timer function block diagram and description – Monostable and Astable operation – PWM - 566 Voltage Controlled Oscillator –. Monolithic PLL IC 565- LORA network					
Total Lecture Hours					75 Hrs
Books for Study:					
1. Roy Choudhury and Shail, Linear Integrated Circuits , Wiley Ltd, New Delhi, III Edition 199 2. 2. Salivahanan.S & Kanchana Bhaskaran. V.S, “ Linear Integrated Circuits ”, TMH, II Edition, 2008					
Books for References:					

1. Gayakwad A.R., **OP – Amps and Linear Integrated Circuits**, Prentice Hall of India, New Delhi, Third Edition, 1993.
2. Conghlin F.R and Driscoll F.F, **Operational Amplifier and Linear Integrated Circuits**, PHI New Jersey, III Edition. 1997.
3. Millman and Halkias, **Integrated Electronics: Analog and Digital Circuits and Systems**, McGraw Hill, Reprint, 1995, New Delhi.

Web Resources:

1. <https://www.digimat.in/nptel/courses/video/108108111/L01.html>
2. <https://www.youtube.com/watch?v=clTA0pONnMs>
3. <https://www.digimat.in/nptel/courses/video/108102112/L01.html>

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Understand the characteristics of Op-Amp	Up to K3
CO2:	Gain the knowledge about the linear applications of an Op-amp	Up to K3
CO3:	Gain the knowledge about the nonlinear applications of an Op-amp	Up to K4
CO4:	Understand the working of regulators and generators.	Up to K4
CO5:	Apply the concepts of special functions of ICs (555,565 and 566) in various circuits.	Up to K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	3
CO 2	2	2	2	3	2	3
CO 3	2	3	1	2	3	2
CO 4	3	2	2	2	2	2
CO 5	2	2	2	1	2	3

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Basic information of Op-amp - Functional Block diagram – Characteristics of an ideal Operational Amplifier – Circuit Schematic of Op Amp 741. Operational Amplifier Characteristics: Open loop gain – CMRR – Input bias and offset currents – Input and output offset voltages – Offset compensation techniques – Frequency response characteristics – Stability – Limitation – Frequency compensation – Slew rate	15	Chalk & Talk
II	Inverting and Non-inverting amplifiers – Voltage follower – Summing amplifier - Differential amplifier – Instrumentation amplifier – Integrator and Differentiator – Voltage to Current converter-Current to voltage converter- High pass-Low pass- Band Stop Filter- Butter worth filters – Narrow band pass Filter.	15	Chalk & Talk
III	Comparators – Regenerative comparator – Zero crossing detector – Sample and Hold circuit – Precision diode – Half wave precision rectifiers – Active peak detector -Clipper and Clamper – Logarithm and Exponential amplifier	15	Chalk & Talk
IV	Waveform generator: Square wave generator-Triangular wave generator- Sine wave generator IC Voltage Regulator: Block diagram of 723 general Purpose of voltage regulator – Dual power supply – Current limiting schemes. Output current boosting – Fixed and adjustable three terminal regulator.	15	Power Point Presentation
V	555 Timer function block diagram and description – Monostable and Astable operation – PWM -566 Voltage Controlled Oscillator –. Monolithic PLL IC 565.-analog multiplexer using op-amp.	15	Power Point Presentation

Course Designed by: **1. Mr. J. Charles Theodore & Mr. M. Satheesh Kumar**

**Learning Outcome Based Education & Assessment (LOBE) Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	COs	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIAI	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3&K3)	1(K3)
CIAII	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3&K3)	1(K4)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIAI	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIAII	K1	2	-	-	--	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	-	20	40	40
	K4	-	-	-	20	20	40	40
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	1(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	1(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	1(K4)
No. of Questions to be Asked			10		5		10	5
No. of Questions to be answered.			10		5		5	3
Marks for each question.			1		2		5	10
Total Marks for each section.			10		10		25	30

(Figures in parenthesis denotes, questions should be asked with the given K level)

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100

NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	LINEAR INTEGRATED CIRCUITS LAB			
Course Code	21UELCP4	L	P	C
Category	Core	-	4	3
Nature of course:	EMPLOYABILITY	✓	SKILL ORIENTED	ENTREPRENEURSHIP
Course Objectives:				
<ol style="list-style-type: none"> 1. To acquire the basic knowledge of op-amp characteristics in practically. 2. To prepare students to perform the analysis and design of op-amp IC741 based circuits. 3. Students will learn and construct the op-amp oscillators. 4. To prepare students to design IC 555 timer based circuits. 5. To design mini project based above practical circuit. 				
<p style="text-align: center;">List of Experiment (Any 12 experiments)</p> <ol style="list-style-type: none"> 1. Inverting Amplifier 2. Dual Power Supply. 3. Non- Inverting Amplifier. 4. Summing Amplifier. 5. Differential Amplifier 6. Differentiator and Integrator. 7. Op-Amp – Phase Shift Oscillator. 8. Op-Amp – Wien’s Bridge Oscillator. 9. IC 555– Astable Multivibrator. 10. IC 555 – Monostable Multivibrator. 11. Positive and Negative Clipper. 12. Positive and Negative Clamper. 13. Comparator. 14. Square wave generator. 15. LORA network experiment 16. Sequence Timer 				
Web Resources:				
https://vlab.amrita.edu/?sub=3&brch=225 https://gcebargur.ac.in/linear-integrated-circuit-lab				
Course Outcomes				K Level
On the successful completion of the course, student will be able to:				
CO1:	Construct the circuits using IC741			K4
CO2:	Construct the Amplifier circuits using op-amp.			K4
CO3:	Make use of oscillator circuits IC 741 op-amp.			K4
CO4:	Construct rectifier and clipper& clamper circuits using op-amp IC741			K4
CO5:	Construct the multivibrators using IC 555 Timer			K4

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	3	3
CO 2	3	2	2	2	3	3
CO 3	3	3	3	2	3	2
CO 4	2	2	2	3	2	3
CO 5	2	2	3	3	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Inverting Amplifier ,Dual Power Supply. Non- Inverting Amplifier	9	Practical
II	Summing amplifier,Difference Amplifier, Differentiator and Integrator. Op-Amp – Phase Shift Oscillator.	9	Practical
III	Op-Amp – Wien’s Bridge Oscillator, IC 555– Astable Multivibrator. IC 555 – Monostable Multivibrator.	9	Practical
IV	Positive and Negative Clipper, Positive and Negative Clamper. Comparator	9	Practical
V	Square wave generator, LORA network experiment, Sequence Timer.	9	Practical

Course Designed by: **1. Mr. M. Satheesh Kumar**
2. Mr.A.Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	FIBER OPTIC COMMUNICATION SYSTEMS				
Course Code	21UELS41	L	P	C	
Category	Skill	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> 1. To remember the theory of fiber optic communication. 2. To describe the different characteristics of optical fiber. 3. To Operation of different types of optical sources 4. To classify the different types of optical detector. 5. To Importance of an optical fiber system. 					
Unit: I	Fundamentals of optical fiber:				06
Optical Fiber – Multimode Step index fiber – Multimode Graded index fiber – Single mode fiber - Block diagram of general communication system-comparison with other communication system-Advantages of optical fiber Communication					
Unit: II	Theory of transmission and Fiber losses:				06
Total internal reflection-Acceptance angle – Numerical aperture - Skew rays – Attenuation – Material absorption loss – Scattering loss – Fiber bend loss					
Unit: III	Optical source:				06
Absorption and emission of radiation-population inversion-optical feedback and laser oscillation - Threshold condition. – Spontaneous emission – Carrier recombination – Stimulated emission and Lasing-LASER-types of laser					
Unit: IV	Optical detection:				06
Device types- Optical detection principles- PN photo diode - P-I-N photo diode- Avalanche Photo diode – Photo Transistor					
Unit: V	Optical Fiber System:				06
Optical transmission circuit - optical receiver circuit - Analog and Digital system - Different multiplexing techniques					
Total Lecture Hours					30 Hrs
Books for Study:					
<ol style="list-style-type: none"> 1. John M.Senior, ” Optic fibre communication.” Pearson Education, New Delhi,India,First Edition,2009. 2. N.Sharma,Tata Mc Graw Hill ”Fiber Optic in telecommunication.”TataMcGraw Hill, New Delhi,First Edition,2003 					
Books for References:					
<ol style="list-style-type: none"> 1. G.Keiser,Optical Fiber communication, TMH .Ltd, New Delhi, First Edition,2010. 2. S.C.Gupta, Optical fiber communication and its Application, PHI Learning Pvt. Ltd, New Delhi,First Edition,2004. 3. Dr.M.Arumugam, Optical communication, Anuradha Publication. 4. Subir Kumar Sarkar Optical fibers and Fibre Optic Communication System S.Chand, New Delhi. 					
Web Resources:					
https://nptel.ac.in/courses/108/106/108106167/					

<https://nptel.ac.in/courses/117/101/117101054/>
<https://nptel.ac.in/courses/108/104/108104113/>

Course Outcomes		K Level
CO1:	Understand the fundamentals of optical fiber	Up to K2
CO2:	Gain the knowledge about the Theory of transmission of optical signal	Up to K2
CO3:	Use and working of optical sources	Up to K2
CO4:	Understand the working of optical detectors	Up to K2
CO5:	Understanding the concept of optical fiber communication system	Up to K2

CO & PO Mapping:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	2	2	2	2	2
CO 2	2	3	1	2	2	3
CO 3	1	2	2	1	1	2
CO 4	3	2	2	2	1	2
CO 5	2	1	2	3	2	1

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Fundamentals of optical fiber: Optical Fiber – Multimode Step index fiber – Multimode Graded index fiber – Single mode fiber - Block diagram of general communication system-comparison with other communication system-Advantages of optical fiber Communication	06	Chalk & Talk
II	Theory of transmission and Fiber losses: Total internal reflection-Acceptance angle – Numerical aperture - Skew rays – Attenuation – Material absorption loss – Scattering loss – Fiber bend loss	06	Chalk & Talk
III	Optical source: Absorption and emission of radiation-population inversion-optical feedback and laser oscillation - Threshold condition. Optical emission from semiconductors: P N Junction – Spontaneous emission – Carrier recombination – Stimulated emission and Lasing LASER-types of laser.	06	Chalk & Talk
IV	Optical detection: Device types- Optical detection principles- PN photo diode - P-I-N photo diode- Avalanche Photo diode – Photo Transistor.	06	Power Point Presentation
V	Optical Fiber System: Optical transmission circuit - optical receiver circuit - Analog and Digital system - Different multiplexing techniques	06	Power Point Presentation

Course Designed by: **1. Mr. A. Velmurugan**
2. Mr. M. Velmurugan



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ELECTRONICS IN EVERYDAY LIFE				
Course Code	21UELN41	L	P	C	
Category	Non-Major Elective	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1. To learn about the microwave oven and induction stove its working principles. 2. To learn about the washing machines and television its working principles. 3. To learn about the Air conditioners and refrigerators and its working principles. 4. To develop skills on using Digital devices and its working principles. 5. To develop skills on using digital access devices.					
Unit: I	MICROWAVE OVENS AND INDUCTION STOVE				06
Microwaves - Properties and generation - Microwave oven block diagram -LCD timer with alarm - Controllers - Wiring and Safety instructions – Care and Cleaning-Induction stove					
Unit: II	WASHING MACHINES AND TELEVISION				06
Electronic controller for washing machines - Washing machine hardware and software - Types of washing machines -Features of washing machines- TV transmitter and receiver basics.					
Unit: III	AIR CONDITIONERS and REFRIGERATORS				06
AIR CONDITIONERS					
Air Conditioning-Components of Air Conditioning System-Water Air Conditioning System- Air Conditioning System-Remote Control buttons.					
REFRIGERATORS					
Refrigeration- Refrigeration System-Domestic Refrigerators.					
Unit: IV	HOME / OFFICE DIGITAL DEVICES				06
Xerographic copier - Calculators - Structure of a calculator - Internal Organization of a calculators - Servicing electronic calculators - Digital clocks - Block diagram of a digital clock					
Unit: V	DIGITAL ACCESS DEVICES				06
Online ticket reservation -Barcode Scanner and decoder - Electronic Fund Transfer. Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV					
Total Lecture Hours					30 Hrs.
Books for Study:					
1. S.P. Bali, Consumer Electronics, Pearson Education, New Delhi, 2005. 2.Devon A Smith ,Everyday Electronics and you, kindle edition,2020.					
Books for References:					
1.Stan Gibilisco, Making Everyday electronics work, Mc Graw , 2014. 2. Michael Jay Geier, Everything electronics,Mc Graw Hill,second Edition,2015					
Web Resources:					
1. https://www.youtube.com/watch?v=Wf19II0ts84 2. https://nptel.ac.in/courses/108/108/108108157/ 3. https://www.classcentral.com/course/swayam-digital-electronic-circuits-12953					
Course Outcomes					K Level
On the successful completion of the course, student will be able to:					

CO1:	Recognize and understand the use of Microwave oven	Up to K2
CO2:	Use and Practice of Washing machine	Up to K2
CO3:	Use and Practice of fridge and Air conditioners	Up to K2
CO4:	Use and Practice of home and office digital device	Up to K2
CO5:	Use and Practice of digital access devices	Up to K2

CO & PO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	3	2	2	2
CO 2	1	1	3	2	2	2
CO 3	2	2	2	1	3	3
CO 4	2	3	2	2	2	1
CO 5	3	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Microwaves - Properties and generation - Microwave oven block diagram -LCD timer with alarm - Controllers - Wiring and Safety instructions – Care and Cleaning-Induction stove	6	Chalk & Talk
II	Electronic controller for washing machines - Washing machine hardware and software - Types of washing machines -Features of washing machines- TV transmitter and receiver basics.	6	Chalk & Talk
III	AIR CONDITIONERS Air Conditioning-Components of Air Conditioning System-Water Air Conditioning System- Air Conditioning System-Remote Control buttons. REFRIGERATORS Refrigeration- Refrigeration System- Domestic Refrigerators	6	Chalk & Talk
IV	Xerographic copier - Calculators - Structure of a calculator - Internal Organization of a calculators - Servicing electronic calculators - Digital clocks - Block diagram of a digital clock	6	Power point presentation
V	Online ticket reservation -Barcode Scanner and decoder – Electronic Fund Transfer. Automated Teller Machines (ATMs) - Set-Top boxes - Digital cable TV	6	Power point presentation

Course Designed by: **1. Mr. M. Velmurugan & Mr. M. Satheesh Kumar**

FIFTH SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	MICROPROCESSOR INTERFACING AND ITS APPLICATIONS				
Course Code	21UELC51	L	P	C	
Category	Core	6	-	5	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Course Objectives:					
1.To enable the students to learn about the 8085 Microprocessor Architecture					
2. To learn the instruction set of 8085 and to develop the programming skills.					
3. To understand the concepts of memory and I/O Interfacing concepts.					
4. To enable the students to learn about the 8086 Microprocessor Architecture and to learn the instruction set of 8086.					
5. To learn the various applications of Microprocessors.					
Unit: I	Architecture of 8085 Microprocessor				18
Functional Block diagram – Registers – ALU – Addressing modes -Timing and Control signals – Machine cycles.					
Unit: II	Programming in 8085:				18
Instruction format – Instruction set – Need for Assembly language – Development of Assembly Language Program.					
Unit: III	Memory and I/O Interfacing Concepts				18
Peripherals I/O Instruction – Device Selection and Data Transfer – Input Interfacing – Interfacing Memory- Bus Contention - Memory Time and Wait States. The 8255A Programmable Peripheral Interface: Block Diagram of 8255A, Mode 0, Simple I/O and BSR Mode, Programming the 8255A in Mode1, Mode 2 – Bidirectional Data Transfer – 8253 Programmable Interval Controller.					
Unit: IV	Architecture of 8086 and Instruction set:				18
Functional block diagram – Registers – Addressing modes – Instruction set- Segment registers – Memory segmentation.					
Unit: V	Applications of Microprocessors:				18
Delay subroutine – 7 segment LED display – Measurement of frequency, voltage and current – Water Level Controller – Stepper motor Controller – Traffic light Control.					
Total Lecture Hours					90 Hrs
Books for Study:					
1. Ramesh S Goankar, Microprocessor Architecture Programming and Application with 8085/8080A ”, IInd Edition, New Age International (P) Ltd					
2. Aditya. P. Mathur, — Introduction to Microprocessors ”, IIIrd Edition					
3. S.Malarvizhi, Microprocessor and Its Application ”, IInd Edition, Anuradha Agencies Publications, March 2006					
Books for References:					
1. Doughlas V.Hall, — Microprocessors and Interfacing, Programming and Hardware , TMH,2012					
2. M. RafiQuazzaman, " Microprocessors Theory and Applications: Intel and Motorola ", Prentice Hall of India, Pvt. Ltd., New Delhi, 2003.					
Web Resources:					

1. <https://nptel.ac.in/courses/108/103/108103157/>
2. https://www.youtube.com/watch?v=t0Z8P_hpbFk&vl=en
3. https://www.youtube.com/watch?v=fS7FFOaC_iQ

EXPECTED COURSE OUTCOME

Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1: Explain the 8085 microprocessor architecture.	K3
CO2: Write programs in 8085 using instruction set.	K3
CO3: Interface the 8085 microprocessor with various peripheral devices	K4
CO4: Understand the concepts of 8086 architecture and instruction set.	K4
CO5: Write programs for their project development	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	2	3
CO 2	3	2	3	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Architecture of 8085 Microprocessor: Functional block diagram – Registers – ALU – Addressing modes - Timing and control signals – Machine cycles.	18	Chalk & Talk
II	Programming in 8085: Instruction format – instruction set – need for Assembly language – Development of Assembly Language Program.	18	Chalk & Talk
III	Memory and I/O Interfacing Concepts Peripherals I/O Instruction – Device Selection and Data Transfer – Input Interfacing – Interfacing Memory Bus Contention - Memory Time and Wait States. The 8255A Programmable Peripherals Interface: Block Diagram of 8255A, Mode 0 Simple I/P O/P BSR Mode, Programming the 8255A in Mode1, Mode 2 – Bidirectional Data Transfer –8253 Programmable Interval Controller	18	Chalk & Talk
IV	Architecture of 8086 and Instruction set: Functional block diagram – Registers – Addressing modes – Instruction set- Segment registers – Memory segmentation	18	Power point presentation
V	Applications of Microprocessors: Delay subroutine – 7 segment LED display – Measurement of frequency, Voltage and Current –Water Level Controller – Stepper motor Controller – Traffic light Control.	18	Power point presentation

Course Designed by: **Dr.G.Pandeeswari**
Mr.A.Velmurugan

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1	2			5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	20	50	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	COMMUNICATION SYSTEMS			
Course Code	21UELC52	L	P	C
Category	Core	6	-	5
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:				
<ol style="list-style-type: none"> 1. To understand the concepts of Wave propagation. 2. To understand the Analog Communication. 3. To understand the Amplitude modulation and demodulation 4. To acquire knowledge on Pulse communication 5. To inculcate the principle of wireless communication 				
Unit: I	Wave Propagation			18
EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Tropospheric Scatter Propagation – Virtual Height – MUF – LUF – Skip Distance.				
Unit: II	Analog Communication			18
Representation of AM - Frequency spectrum of AM- Generation of AM- Basic requirements – comparison of levels – modulated transistor amplifier – single side band Technique – Representation of FM – Generation of FM – FM methods – Direct methods – Indirect methods - Demodulation techniques of AM and FM.				
Unit: III	Pulse Communication			18
Introduction to Pulse Modulation – Types - Pulse Amplitude Modulation (PAM) – Pulse Frequency Modulation (PFM)– Pulse Time Modulation (PTM) – Pulse Width Modulation (PWM) – Pulse Position Modulation (PPM)- Pulse code Modulation (PCM) – Block diagram of PCM transmission and reception				
Unit: IV	Digital Communication			18
Generation and Detection of ASK circuit – Generation and Detection of FSK circuit – Generation and Detection of PSK circuit – Quadrature Amplitude Modulation. M-Ary ASK – M-Ary FSK – M-Ary PSK.				
Unit: V	Wireless Communication			18
Cellular concept – The advanced Mobile Phone System – AMPS control System – Cellular Telephone specification and operations with block diagram – Cellular Base Station – Cellular Radio System – Digital cellular system.				
Total Lecture Hours				90 Hrs
Books for Study:				
<ol style="list-style-type: none"> 1. Kennedy Davis, Electronic Communication Systems, Tata McGraw Hill Publishing Company Ltd, Fourth Edition, 1999, New Delhi (unit I) 2. Simon Haykin, An Introduction to Analog and Digital Communications, John Wiley and sons (Asia) Pvt. Ltd, 1989, Singapore. (unit II, III) 3. K. Sam Shanmugam, Digital and Analog Communication System, John Wiley & Sons (Asia) Pvt. Ltd, 1979, Singapore. (Unit IV, V) 				
Books for References:				
1. Martin S. Roden, Analog and Digital Communication Systems , Prentice Hall, First				

Edition, 1985, New Delhi.

2. Lathi, B.P, **Modern Digital and Analog Communication Systems**, Oxford University Press, USA, First Edition, 1998. power
3. Srinivasan K.S. **Analog and Digital Communication** Anuradha Publications, 2nd Edition, 2011.
4. Electronics Communication by Dennis Roddy, John Collen.

Web Resources:

https://swayam.gov.in/nd1_noc20_ee16/preview

https://swayam.gov.in/nd1_noc19_ee47/preview

EXPECTED COURSE OUTCOME

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Understand the basic of EM waves and wave propagation	K3
CO2:	Analyze the performance of Analog Communication techniques	K3
CO3:	Demonstrate the stages Pulse communication techniques	K4
CO4:	Understand the concepts of Digital communication	K4
CO5:	Understand the wireless communication concepts	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Wave Propagation EM Waves – Free Space Propagation – Surface Wave Propagation – Sky Wave Propagation – Space Wave Propagation – Tropospheric Scatter Propagation – Virtual Height – MUF – LUF – Skip Distance.	18	Chalk & Talk
II	Analog Communication Representation of AM - Frequency spectrum of AM- Generation of AM- Basic requirements – comparison of levels – modulated transistor amplifier – single side band Technique – Representation of FM – Generation of FM – FM methods – Direct methods – Indirect methods -Demodulation techniques of AM and FM.	18	Chalk & Talk
III	Pulse Communication Introduction to Pulse Modulation – Types - Pulse Amplitude Modulation (PAM) – Pulse Frequency Modulation (PFM)– Pulse Time Modulation (PTM) – Pulse Width Modulation (PWM) – Pulse Position Modulation (PPM)- Pulse code Modulation (PCM) – Block diagram of PCM transmission and reception	18	Chalk & Talk
IV	Digital Communication Generation and Detection of ASK circuit – Generation and Detection of FSK circuit – Generation and Detection of PSK circuit – Quadrature Amplitude Modulation. M-Ary ASK – M-Ary FSK – M-Ary PSK.	18	Power point presentation
V	Wireless Communication Cellular concept – The advanced Mobile Phone System – AMPS control System – Cellular Telephone specification and operations with block diagram – Cellular Base Station – Cellular Radio System – Digital cellular system.	18	Power point presentation

Course Designed by: Dr.G.Pandeeswari
Mr.A.Velmurugan

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AII	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1	2			5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	3.3	17
	K2	2	6	-	-	8	13.3	
	K3	-	-	20	30	50	83.3	83
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	40	60	100	100
CIA II	K1	2	-	-	-	2	3.3	17
	K2	2	6	-	-	8	13.3	
	K3	-	-	20	-	20	33.3	33
	K4	-	-	-	30	30	50	50
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	Microprocessor and Interfacing Lab			
Course Code	21UELCP5	L	P	C
Category	Core	-	3	2
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:				
<ol style="list-style-type: none"> To develop the assembly language programming of Microprocessor and to interface it with various peripheral devices To develop the assembly language program using data transfer instruction. To develop the assembly language program using arithmetic instruction To develop the assembly language program using branch instruction To develop the assembly language program using interfacing instruction. 				

List of Experiment	
<ol style="list-style-type: none"> Addition / Subtraction/ Multiplication / Division of 8 bit data Block Data Transfer and Sum of N 8 bit Numbers To Arrange in Ascending / Descending order UP/DOWN Counter using 7 segment displays Traffic Light Control Interface LED Interface Stepper Motor Interface Solid State Relay Interface Data Transfer using 8255 (PPI) Square Wave Generator using 8255 Interfacing ADC and DAC with 8085. 	
Web Resources:	
http://vlabs.iitb.ac.in/vlabs-dev/labs_local/microprocessor/labs/explist.php	
EXPECTED COURSE OUTCOME	K Level
On the successful completion of the course, student will be able to:	

CO1:	Gain knowledge of data transfer Programming of 8085	K4
CO2:	Gain knowledge of arithmetic Programming of 8085	K4
CO3:	Knowledge about branch instruction based Programming of 8085	K4
CO4:	Knowledge about logic Programming of 8085	K4
CO5:	Understand the wave form generation and interfacing Programming of 8085	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	3	1
CO 2	2	2	2	2	3	3
CO 3	2	3	3	3	1	3
CO 4	3	2	1	2	2	2
CO5	2	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Addition / Subtraction/ Multiplication / Division of 8 bit data Block Data Transfer and Sum of N 8 bit Numbers	9	Practical
II	To Arrange in Ascending / Descending order UP/DOWN Counter using 7 segment displays	9	Practical
III	Traffic Light Control Interface LED Interface	9	Practical
IV	Stepper Motor Interface Solid State Relay Interface	9	Practical
V	Data Transfer using 8255 (PPI) 10.Square Wave Generator using 8255. Interfacing ADC / DAC with 8085	9	Practical

**Course Designed by: Dr.G.Pandeeswari
Mr.A.Velmurugan**



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	COMMUNICATION LAB			
Course Code	21UELCP6	L	P	C
Category	Core	-	3	2
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:				
1. To understand the concept of working of Different types of Filter experiments.				
2. To experiment the Analog modulation and detection techniques				
3. To experiment the Digital modulation and detection techniques				
4. To experiment the voltage to frequency converter.				
5. To experiment the sample & hold circuits, cross over network and PLL circuit.				

List of Experiment

1. Low pass active filters.
2. High pass active filters.
3. Band pass active filters
4. Band rejection active filters.
5. Sampling and reconstruction of signals.
6. Amplitude Modulation and Demodulation.
7. Suppressed Carrier amplitude Modulation.
8. Frequency Modulation and Demodulation.
9. Pulse Amplitude Modulation and Demodulation.
10. Pulse Width Modulation and Demodulation.
11. Pulse Position Modulation and Demodulation.
12. Phase lock loop

Related Online Contents (MOOC, SWAYAM, NPTEL, Websites etc.)

<https://www.vlab.co.in/ba-nptel-labs-electronics-and-communications>

EXPECTED COURSE OUTCOME		K Level
On the successful completion of the course, student will be able to:		
CO1:	Design the Filters circuits (Low pass, High pass, Band pass and Band reject)	K4
CO2:	Design the working principles of modulation and demodulation techniques	K4
CO3:	Knowledge about branch instruction based Programming of 8085	K4
CO4:	Construct analog and digital demodulation circuits	K4
CO5:	Construct ADC and DAC using IC0804 and R-2R ladder circuit.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	3	1
CO 2	2	2	2	2	3	3
CO 3	2	3	3	3	1	3
CO 4	3	2	1	2	2	2
CO5	2	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Low pass active filters. High pass active filters. Band pass active filters Band rejection active filters.	9	Practical
II	Sampling and reconstruction of signals. Amplitude Modulation and Demodulation. Suppressed Carrier amplitude Modulation.	9	Practical
III	Frequency Modulation and Demodulation. Pulse Amplitude Modulation and Demodulation. Pulse Width Modulation and Demodulation.	9	Practical
IV	Pulse Position Modulation and Demodulation. Phase lock loop	9	Practical

**Course Designed by: Mr.J.Charles theodore
Mr.A.Velmurugan**



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	MICROWAVE AND RADAR SYSTEMS				
Course Code	21UELE51	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1. To impart knowledge on the working principle of microwave tube, microwave solid state device and communication systems. 2. To gain knowledge on the operation of Microwave tubes and Microwave solid state devices. 3. To understand the concepts of Microwave Communication Devices. 4. To understand the concepts of Microwave Communication Systems. 5. To gain knowledge on Radar Communication systems.					
Unit: I	Introduction to Microwaves				15
Introduction – Maxwell’s Equations – Types of Wave Guides – TE and TM Modes – Propagation of TM Waves in Rectangular Wave Guide – TM Modes in Rectangular Wave Guide.					
Unit: II	Microwave Tubes				15
High Frequency limitation of conventional tubes – Principle of velocity modulation – Klystron amplifiers – Reflex Klystrons – Magnetron oscillators – Travelling wave tubes – Backward oscillators					
Unit: III	MICROWAVE SOLID STATE DEVICES				15
High Frequency limitations – Microwave transistors – Varactor diode – Parametric amplifier – Tunnel diodes – Theory of negative resistance amplifiers – Gunn effect – Gunn diode oscillators – Avalanche effect IMPATT and TRAPATT diodes – Lasers and Masers.					
Unit: IV	MICROWAVE COMMUNICATION SYSTEMS:				15
Micro wave Antennas - Microwave system block diagram – Repeaters – Need for diversity – Frequency and space diversity – Protection switching arrangements – Microwave radio communication- system gain.					
Unit: V	RADAR SYSTEMS:				15
Radar range equations – Mono static and bio static radars – CW (Continuous wave) Radar – Frequency modulated CW radar – MTI and pulse Doppler radar – Duplexers – displays- radar antennas – Case study in Automated traffic systems.					
Total Lecture Hours					75 Hrs
Books for Study:					
1. Reich J.H.,”MICROWAVE PRINCIPLES”, Van nostrand Reinhold co., 1 st edition, 1987. 2.George Kennedy, Bernard Davis and S R M Prasanna, Electronic Communication System McGrawhill Education, Sixth Edition					
Books for References:					
1. Tomasi w. “ADVANCED ELECTRONIC COMMUNICATION SYSTEMS”, Prentice Hall International, 1987.					

2. Liao Y.S., “MICROWAVE DEVICE AND CIRCUITS”, Prentice Hall of India, 3rd Edition, 5th reprint 1992.
3. Solink M.I., “INTRODUCTION TO RADAR SYSTEMS”, McGraw Hill, 2nd Edition, 1992.

Web Resources

1. https://onlinecourses.nptel.ac.in/noc19_ee58/preview
2. <https://nptel.ac.in/courses/108/105/108105154/>
3. <https://www.classcentral.com/course/swayam-microwave-engineering-14199>

EXPECTED COURSE OUTCOME

Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1: Understand the theory of microwave and Radar systems	K3
CO2: Discuss the working of microwave amplifiers, oscillators and devices.	K3
CO3: Design and analyze the microwave amplifiers, oscillator and devices.	K4
CO4: Illustrate the different types of radar systems	K4
CO5: Evaluate the concepts of Radar transmitter and receiver.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction to Microwaves: Introduction – Maxwell’s Equations – Types of Wave Guides – TE and TM Modes – Propagation of TM Waves in Rectangular Wave Guide – TM Modes in Rectangular Wave Guide.	15	Chalk & Talk
II	Microwave Tubes: High Frequency limitation of conventional tubes – Principle of velocity modulation – Klystron amplifiers – Reflex Klystrons – Magnetron oscillators – Travelling wave tubes – Backward oscillators	15	Chalk & Talk
III	MICROWAVE SOLID STATE DEVICESL: High Frequency limitations – Microwave transistors – Varactor diode – Parametric amplifier – Tunnel diodes – Theory of negative resistance amplifiers – Gunn effect – Gunn diode oscillators – Avalanche effect IMPATT and TRAPATT diodes – Lasers and Masers.	15	Chalk & Talk
IV	MICROWAVE COMMUNICATION SYSTEMS: Micro wave Antennas - Microwave system block diagram – Repeaters – Need for diversity – Frequency and space diversity – Protection switching arrangements – Microwave radio communication- system gain.	15	Power point presentation
V	RADAR SYSTEMS: Radar range equations – Mono static and bio static radars – CW (Continuous wave) Radar – Frequency modulated CW radar – MTI and pulse Doppler radar – Duplexers – displays- radar antennas – Case study in Automated traffic systems.	15	Power point presentation

**Course Designed by: Dr. D. Sivaranjani
Mr. J. Charles Theodore**

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AII	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Questions	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	Internet of Things			
Course Code	21UELE52	L	P	C
Category	Core	5	-	5
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	ENTREPRENEURSHIP	✓
Course Objectives:				
<ol style="list-style-type: none"> 1. To enable the students to learn about IoT. 2. To understand the concept of data and device management. 3. To enable the students to learn about the Programming Fundamentals With C Using Arduino 4. To understand the interfacing concepts. 5. To gain knowledge about the applications in IoT. 				
Unit: I	IOT Fundamentals			15
Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT.				
Unit: II	Design Principles For Connected Devices			15
Introduction-IoT/M2m systems - Communication Technologies - Data management, data consolidation and Device management - Ease of Designing and Affordability				
Unit: III	Programming Fundamentals With C Using Arduino IDE			15
Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators – Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions.				
Unit: IV	Sensors and Actuators			15
Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino				
Unit: V	Sending Sensor Data over Internet			15
Introduction to ESP8266 NODEMCU, ESP 32 - WiFi Module – Programming NODEMCU using Arduino IDE - MQTT – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform .				
Total Lecture Hours				75 Hrs
Books for Study:				
<ol style="list-style-type: none"> 1. A. Arshdeep Bahga, Vijay Madiseti, “<i>Internet of Things: A Hands-On Approach</i>”, Orient Blackswan Pvt. Ltd., First edition, 2015. 2. Boris Adryan, DominikObermaier, Paul Fremantle, —The Technical Foundations Of IoT”, Artech Houser Publishers, 2017. 				
Books for References:				
<ol style="list-style-type: none"> 1.Jeeva Jose “Internet of Things” Khanna Book Publishing Co Pvt Ltd. NewDelhi 2.David Etter, IOT (Internet of Things) Programming: A Simple and Fast Way of Learning IOT 				
Web Resources:				
1. https://nptel.ac.in/courses/106/105/106105166/Introduction to IoT Part I – Lecture 1				

2. <https://ocw.cs.pub.ro/courses/iot/courses/02Electronics for Internet of Things – Lecture II>
 3. <https://nptel.ac.in/courses/106105166/Introduction to Arduino – I – Lecture 22>

EXPECTED COURSE OUTCOME

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Study the concept of basic IoT	K3
CO2:	Familiarize the principle of connected devices	K3
CO3:	Gain knowledge about embedded devices	K4
CO4:	Analyze different sensor Interface technology	K4
CO5:	Analyze the IoT applications	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	IOT Fundamentals Introduction to IoT: Evolution of IoT – Definition & Characteristics of IoT - Architecture of IoT – Technologies for IoT – Developing IoT Applications – Applications of IoT – Industrial IoT – Security in IoT.	15	Chalk & Talk
II	Design Principles For Connected Devices: Introduction-IoT/M2m systems - Communication Technologies - Data management, data consolidation and Device management - Ease of Designing and Affordability	15	Chalk & Talk
III	Programming Fundamentals With C Using Arduino IDE Arduino IDE – Basic Syntax – Data Types/ Variables/ Constant – Operators –Conditional Statements and Loops – Using Arduino C Library Functions for Serial, delay and other invoking Functions – Strings and Mathematics Library Functions	15	Chalk & Talk
IV	Sensors and Actuators Analog and Digital Sensors – Interfacing temperature sensor, ultrasound sensor and infrared (IR) sensor with Arduino – Interfacing LED and Buzzer with Arduino.	15	Power point presentation
V	RADAR SYSTEMS: Introduction to ESP8266 NODEMCU, ESP 32 - WiFi Module – Programming NODEMCU using Arduino IDE - MQTT – Using WiFi and NODEMCU to transmit data from temperature sensor to Open Source IoT cloud platform .	15	Power point presentation

**Course Designed by: Dr.G.Pandeeswari
Mr.A.Velmurugan**

**Learning Outcome Based Education & Assessment (LOBE)
Formative Examination - Blue Print
Articulation Mapping – K Levels with Course Outcomes (COs)**

Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AII	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II

	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	MOBILE TECHNOLOGY			
Course Code	21UELE53	L	P	C
Category	Core Elective	5	-	5
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP
Course Objectives:				
1. To understand the concept of mobile Communication.				
2. To know about the mobile communication standards.				
3. To understand about multiple access techniques				
4. To apply the concepts of mobile servicing.				
5. To gain knowledge on service tools.				
Unit: I	MOBILE DATA COMMUNICATION			15
Introduction – Antennas for mobile communication – Cellular Radio – Elements of a Cellular Network – Cellular Telephony – Radio Propagation – Speech Coding – Error Coding and Error Correction.				
Unit: II	MOBILE COMMUNICATION TECHNIQUES			15
Mobility Management - Hand Off Management – Hard Hand Off – Soft Hand Off – Switching and Authentication – MTSO Interconnections- Circuit Switched and Packet Switched Data Services on Cellular Networks.				
Unit: III	MULTIPLE ACCESS TECHNOLOGIES			15
Introduction - Frequency division multiple access - Time division multiple access - Code Division Multiple Access – Spread Spectrum Techniques				
Unit: IV	MOBILE SERVICING			15
Hardware/Software Repairing - Various Locks - Installation of: UFS Driver, UFS Suite & Flashing Files - IMEI Number Detection – Mobile Utility Codes.				
Unit: V	OTHER MOBILE SERVICE TOOLS			15
Ultrasonic Cleaner - Computer Connectors - SIM Card Reader - Memory Card Reader - Mobile Virus - Virus Prevention - Removing Virus - Health Hazards with Mobiles - SAR.				
Total Lecture Hours				75 Hrs
Books for Study:				
1. Wireless Communications and Networking – Made Simple – Satish Jain – BPB Publications. (Units : I , II & III)				
2. Modern Mobile Phone Repair using Computer Software & Service Devices – Manahar Lotia - (Units IV & V)				
3. Modern Mobile Phone Unlocking & Utility Codes For GSM & CDMA Phones – Manahar Lotia - (Unit IV)				
Books for References:				

1. Mobile Cellular Telecommunication – II Edition - William CY Lee – TMH
2. Mobile Communications – Schiller – Pearson – II Edition.
3. Wireless Communications – Stalling – Pearson II Edition.
4. Mobile & Personal Communication Systems & Services - Raj Pandya - PHI – Rs.250/-.

Web Resources:

1. https://swayam.gov.in/nd1_noc20_ee16/preview
2. https://swayam.gov.in/nd1_noc19_ee47/preview

EXPECTED COURSE OUTCOME

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Remember the modulation techniques and elements of communication system.	K3
CO2:	Summarize different technique in mobile communication.	K3
CO3:	Identify the concepts of GSM and multiple access techniques.	K4
CO4:	classify various installation types of mobile communication	K4
CO5:	Importance of mobile service tools.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	MOBILE DATA COMMUNICATION Introduction – Antennas for mobile communication – Cellular Radio – Elements of a Cellular Network – Cellular Telephony – Radio Propagation – Speech Coding – Error Coding and Error Correction.	15	Chalk & Talk
II	MOBILE COMMUNICATION TECHNIQUES Mobility Management - Hand Off Management – Hard Hand Off – Soft Hand Off – Switching and Authentication – MTSO Interconnections- Circuit Switched and Packet Switched Data Services on Cellular Networks.	15	Chalk & Talk
III	MULTIPLE ACCESS TECHNOLOGIES Introduction - Frequency division multiple access - Time division multiple access - Code Division Multiple Access – Spread Spectrum Techniques.	15	Chalk & Talk
IV	MOBILE SERVICING Hardware/Software Repairing - Various Locks - Installation of: UFS Driver, UFS Suite & Flashing Files - IMEI Number Detection – Mobile Utility Codes.	15	Power point presentation
V	OTHER MOBILE SERVICE TOOLS : Ultrasonic Cleaner - Computer Connectors - SIM Card Reader - Memory Card Reader - Mobile Virus - Virus Prevention - Removing Virus - Health Hazards with Mobiles - SAR.	15	Power point presentation

**Course Designed by: Dr.D.Sivaranjani
Dr.G.Pandeeswari.**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	POWER ELECTRONICS				
Course Code	21UELE54	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1.To understand the concepts of Thyristor					
2. To enable the students to learn the concepts of Turn On –Off Mechanism					
3. To understand the concepts of Inverters and Cyclo converters					
4. To understand the concept of chopper.					
5. To enable the students to how to apply the power electronic circuits.					
Unit: I	Thyristor Devices				15
Power electronics – types of power electronics – Introduction to thyristor - Operation and Characteristics of thyristor – Power transistors –TRIAC – DIAC – GTO – SUS - SBS – IGBT					
Unit: II	Turn ON/OFF Mechanisms				15
Introduction– Types of Turn on Methods: AC Gate Triggering: Forward Voltage Triggering– Thermal Triggering– Radiation Triggering– DC Gate Triggering: Pulse Triggering – Types of Turn Off Methods: Natural Commutation – Forced Commutation: Class A-Class B-Class C-Class D-Class E and Class F Commutation					
Unit: III	Inverters and Cyclo Converter				15
Inverters: operating Principle - Single phase bridge inverter - Three phase bridge inverter - Pulse width modulated inverters - Single Pulse Modulation-Multiple Pulse modulation –sinusoidal pulse modulation Cyclo converters; Single phase Cyclo Converters-Three phase Cyclo converters					
Unit: IV	Choppers and Regulator				15
Introduction – Principle of Chopper Operation-types of chopper - Step up choppers – Step down Choppers - Switching Regulator-Buck Regulator-Boost regulator					
Unit: V	Thyristors Applications				15
Automatic Water level indicator using SCR–Automatic battery charger using SCR –Automatic Street light using SCR – Battery Charger –Emergency Light using SCR-Burglar alarm using SCR.					
Total Lecture Hours					75 Hrs
Books for Study:					
1. MD. Singh, — PowerElectronics , 2 nd Edition, Tata-McGrawHill, 2007.					
2. M. Ramamoorthy — Thyristor and theirApplications ,2 nd Edition, East West Pvt.Ltd,1999					
Books for References:					
1. Harish C Rai, “ Industrial and Power Electronics ” 10 th edition, Umesh publications 2002					
2. Timothy J Maloni, “ Industrial Solid State Electronic Devices and Circuits ” 2 nd edition 1986					
Web Resources:					
1. https://www.youtube.com/watch?v=1Auay7ja2oY					
2. https://www.youtube.com/watch?v=oqnLQVFaqYI					
3. https://www.youtube.com/watch?v=naxnRkOfh2Q					
EXPECTED COURSE OUTCOME					
Course Outcomes					K Level

On the successful completion of the course, student will be able to:		
CO1:	Understand the Concepts of the thyristor device working	K3
CO2:	Understand the concept of Turn on off mechanism of Thyristor.	K3
CO3:	Acquire knowledge about basic concepts of inverters and Cyclo converters..	K4
CO4:	Ability to analyze various types of Choppers.	K4
CO5:	Apply the Thyristor devices in industrial needs.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Thyristor Devices Power electronics – types of power electronics – Introduction to thyristor - Operation and Characteristics of thyristor – Power transistors –TRIAC – DIAC – GTO – SUS - SBS – IGBT	15	Chalk & Talk
II	Turn ON/OFF Mechanisms Introduction– Types of Turn on Methods: AC Gate Triggering: Forward Voltage Triggering– Thermal Triggering– Radiation Triggering– DC Gate Triggering: Pulse Triggering – Types of Turn Off Methods: Natural Commutation – Forced Commutation: Class A-Class B-Class C-Class D-Class E and Class F Commutation	15	Chalk & Talk
III	Inverters and Cyclo Converter Inverters: operating Principle - Single phase bridge inverter - Three phase bridge inverter - Pulse width modulated inverters - Single Pulse Modulation-Multiple Pulse modulation –sinusoidal pulse modulation Cyclo converters; Single phase Cyclo Converters-Three phase Cyclo converters	15	Chalk & Talk
IV	Choppers and Regulator Introduction – Principle of Chopper Operation-types of chopper - Step up choppers – Step down Choppers - Switching Regulator-Buck Regulator-Boost regulator.	15	Power point presentation
V	Thyristors Applications Automatic Water level indicator using SCR–Automatic battery charger using SCR –Automatic Street light using SCR – Battery Charger –Emergency Light using SCR-Burglar alarm using SCR.	15	Power point presentation

Course Designed by: Mr.A.Velmurugan

Dr.G.Pandeeswari.

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	PCB DESIGN AND FABRICATION				
Course Code	21UELE55	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED ✓	ENTREPRENEURSHIP		
Course Objectives:					
1. To inculcate the knowledge of PCB design					
2. To impart knowledge on various methods of laying out a PCB					
3. To learn how to etch and solder					
4. To understand layout and artwork.					
5. To understand the concepts of transmission line, crosstalk and thermal issues.					
Unit: I	Types Of PCB				15
Single sided layer – double sided layer – Multilayer – Types of PCB board - Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.					
Unit: II	Layout And Artwork				15
Planning – General Rules of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and Mounting – Cooling Requirement and Package Density – Layout Check Basic Artwork Approaches – Artwork Taping Guidelines – General Artwork Rules – Artwork Check and inspection.					
Unit: III	Laminates and Photo Printing				15
Manufacture of Copper Clad Laminates – Properties of Laminates – Types of Laminates – Manual Cleaning Process – Basic Printing Process for Double Sided PCB's – Photo Resists – Wet Film Resists – Coating Process for Wet Film Resists – Exposure and Further Process for Wet Film resists – Dry Film Resists					
Unit: IV	Etching and Soldering				15
Etching and Soldering					
Introduction – Etching Machine – Etchant System - Soldering: Principles of Solder Connection – Solder Joints – Solder Alloys – Soldering Fluxes - Soldering Tools: Soldering – De-soldering Tools and Techniques – Man Soldering – Solder Mask – Safety, Health and Medical Aspects in Soldering Practice					
Unit: V	Design Rules And Automation				15
Reflection – Crosstalk – Ground and Supply Line Noise – Electromagnetic Interference from Pulse Type EM Fields and Automation – Automated Artwork Drafting – CAD					
				Total Lecture Hours	75 Hrs
Books for Study:					
1. 1. Walter C. Bosshart, —PCB Design and Technology], Tata McGraw Hill Publications, Delhi 1983					
2. RS Khandpur, —Printed Circuit Board by Tata McGraw Hill Education Pvt Ltd., New Delhi					

Books for References:

1. S D Mehta , —Electronic Product Design| Volume-I S Chand Publications

Web Resources

1. <https://www.wikihow.com/Create-Printed-Circuit-Boards>
2. http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/
3. https://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
4. <https://www.youtube.com/watch?v=mv7Y0A9YeUc>
5. <https://www.youtube.com/watch?v=imQTCW1vWkg>

EXPECTED COURSE OUTCOME

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Classify the boards and layers	K3
CO2:	Design layout and make use of the photo printing and etching techniques	K3
CO3:	Understand basic concepts of transmission line, crosstalk and thermal issues	K4
CO4:	Understand the design rules and automation techniques	K4
CO5:	Design (schematic and layout) PCB for analog circuits, digital circuits and mixed circuits	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Types Of PCB Single sided layer – double sided layer – Multilayer – Types of PCB board - Plated through holes technology – Benefits of Surface Mount Technology (SMT) – Limitation of SMT – Surface mount components: Resistors, Capacitor, Inductor, Diode and IC's.	15	Chalk & Talk
II	Layout And Artwork Planning – General Rules Layout of Layout – Resistance, Capacitance and Inductance – Conductor Spacing – Supply and Ground Conductors – Component Placing and Mounting – Cooling Requirement and Package Density – Layout Check Basic Artwork Approaches – Artwork Taping Guidelines – General Artwork Rules – Artwork Check and inspection	15	Chalk & Talk
III	Laminates and Photo Printing Manufacture of Copper Clad Laminates – Properties of Laminates – Types of Laminates – Manual Cleaning Process – Basic Printing Process for Double Sided PCB's – Photo Resists – Wet Film Resists – Coating Process for Wet Film Resists – Exposure and Further Process for Wet Film resists – Dry Film Resists	15	Chalk & Talk
IV	Etching and Soldering Introduction – Etching Machine – Etchant System - Soldering: Principles of Solder Connection – Solder Joints – Solder Alloys – Soldering Fluxes - Soldering Tools: Soldering – De-soldering Tools and Techniques – Man Soldering – Solder Mask – Safety, Health and Medical Aspects in Soldering Practice	15	Power point presentation
V	Design Rules And Automation Reflection – Crosstalk – Ground and Supply Line Noise – Electromagnetic Interference from Pulse Type EM Fields and Automation – Automated Artwork Drafting – CAD	15	Power point presentation

**Course Designed by: Mr.A.Velmurugan
Dr.G.Pandeeswari.**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA I	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CIA II	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	PROGRAMMABLE LOGIC CONTROLLER				
Course Code	21UELE56	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP		
Course Objectives:					
1. To understand the programmable logics.					
2. To understand the operation of PLC and I/O modules.					
3. To train the students to create ladder diagrams from process control description and understand various types of PLC registers					
4. To Apply PLC Timers and Counters for the control of industrial processes, PLC functions and Data Handling Functions.					
5. To Understand the application of PLCs.					
Unit: I	Programmable Logic				15
Programmable Logic – Introduction - Programmable Logic Structures - Programmable Logic Arrays (PLAS), Programmable Array Logic (Pals), Programmable Gate Arrays (PGAS), Field Programmable Gate Arrays(FPGAS) - Sequential Network Design With Programmable Logic Devices (PLDs) -Design of Sequential Networks Using ROMs and Flash -Traffic Light Controller Using PAL					
Unit: II	Programmable Logic Controllers				15
Programmable Logic Controllers (PLCS) - Introduction Parts Of PLC - Principles of Operation- PLC Sizes - PLC Hardware Components - I/O Section - Analog I/O Section - Analog I/O Modules, Digital I/O Modules CPU - Processor Memory Module - Programming Devices -Diagnostics of PLCS with Computers					
Unit: III	Basics of PLC Programming				15
PLC Programming-Simple Instructions - Programming EXAMINE ON And EXAMINE OFF Instructions -Electromagnetic Control Relays-Motor Starters -Manually Operated Switches - Mechanically Operated and Proximity Switches - Output Control Devices - Latching Relays - PLC Ladder Diagram - Converting Simple Relay Ladder Diagram into PLC Relay Ladder Diagram					
Unit: IV	PLC Instructions				15
Timer Instructions ON DELAY Timer and OFF DELAY Timer - Counter Instructions - Up/Down Counters -Timer and Counter Applications - Program Control Instructions - Data Manipulating Instructions - Math Instructions					
Unit: V	Applications of PLC & SCADA				15
Simple Materials Handling Applications - Automatic Control of Warehouse Door - Automatic Lubricating Oil Supplier Conveyor Belt - Motor Control Automatic Car Washing Machine – SCADA.					
Total Lecture Hours					75 Hrs
Books for Study:					
1.Charles H. Roth, Jr“ Fundamentals of Logic Design ", Fourth Edition, Jaico Publishing					
2.Frank D. Petruzella" Programmable Logic Controllers ", McGraw- Hill book, company,					
3. Siemens “ PLC Handbook ".					

Books for References:	
1. William I. Fletcher “An Engineering Approach to Digital Design ”, Prentice, Hall of India Ltd., New Delhi, 1999.	
Web Resources	
1. https://unitronicsplc.com/what-is-plc-programmable-logic-controller/	
EXPECTED COURSE OUTCOME	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Gain knowledge on Programmable Logic Controllers K3
CO2:	Devices to which PLC input and output modules K3
CO3:	Gain knowledge about various types of PLC registers, ladder diagrams from process control descriptions K4
CO4:	Develop a coil and contact control system and analog PLC operations K4
CO5:	Apply time delay on PLC operations K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	3	2	2	3
CO 2	3	2	3	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	3	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Programmable Logic Programmable Logic – Introduction - Programmable Logic Structures - Programmable Logic Arrays (PLAS), Programmable Array Logic (Pals), Programmable Gate Arrays (PGAS), Field Programmable Gate Arrays(FPGAS) - Sequential Network Design With Programmable Logic Devices (PLDs) -Design of Sequential Networks Using ROMs and Flash - Traffic Light Controller Using PAL	15	Chalk & Talk
II	PLC Instructions Timer Instructions ON DELAY Timer and OFF DELAY Timer - Counter Instructions - Up/Down Counters -Timer and Counter Applications - Program Control Instructions - Data Manipulating Instructions - Math Instructions	15	Chalk & Talk
III	Basics of PLC Programming PLC Programming-Simple Instructions - Programming EXAMINE ON And EXAMINE OFF Instructions -Electromagnetic Control Relays-Motor Starters - Manually Operated Switches -Mechanically Operated and Proximity Switches - Output Control Devices - Latching Relays - PLC Ladder Diagram - Converting Simple Relay Ladder Diagram into PLC Relay Ladder Diagram	15	Chalk & Talk
IV	Timer Instructions ON DELAY Timer and OFF DELAY Timer - Counter Instructions - Up/Down Counters -Timer and Counter Applications - Program Control Instructions - Data Manipulating Instructions - Math Instructions	15	Power point presentation
V	Applications of PLC & SCADA: Simple Materials Handling Applications - Automatic Control of Warehouse Door - Automatic Lubricating Oil Supplier Conveyor Belt - Motor Control Automatic Car Washing Machine – SCADA.	15	Power point presentation

**Course Designed by: Mr.A.Velmurugan
Dr.G.Pandeeswari.**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	BIO-MEDICAL INSTRUMENTATION				
Course Code	21UELS51	L	P	C	
Category	Skill	2	-	2	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1. To understand the basic physiology.					
2. To gain knowledge about different electrodes and bioelectric signals.					
3. To understand the concepts of Biomedical recorders.					
4. To gain knowledge for medical instruments, signal conditioners and diagnostic equipment.					
5. To understand the Physiological Assisting devices.					
Unit: I	BIOPOTENTIALS:				06
Introduction - Tissues, Muscles and Nervous System-Cellular fluids, Transmembrane potential-action potentials - Generation & Characteristics - Physiological - transducers, Biosensors, Smart sensors.					
Unit: II	BIOELECTRIC SIGNALS AND ELECTRODES:				06
Origin of bioelectrical signals – Recording electrodes – Skin contact – Impedance – Electrodes for ECG – EMG and EEG – Electrical conductivity of electrodes- jellies creams microelectrodes.					
Unit: III	BIOMEDICAL RECORDERS AND PATIENTS MONITORING SYSTEMS:				06
Block diagram and signal analysis of phonocardiography - Electroencephalograph. – Electromyography – Measurement of heart rate – Measurement of blood pressure –Measurement of blood flow and cardiac output – Measurement of temperature – Measurement of respiration rate-					
Unit: IV	THERAPEUTIC EQUIPMENTS:				06
Cardiac pacemaker - Cardiac defibrillators – Surgical diathermy – software diathermy – Microwave diathermy- ultrasonic therapy unit – Pain relief therapy electrical stimulation.					
Unit: V	MODERN IMAGING SYSTEMS:				06
Computer X ray machine - X ray computer tomography – Basic NMR components – Echocardiography - Thermography equipment.					
Total Lecture Hours					30 Hrs
Books for Study:					
1. L.Cromwell.F., J.,Weibell and E.A.Pfeiffer.” Bio-Medical Instrumentation and Measurements ”. PHI, 1991.					
Books for References:					
1. R.Khandpur. “ Hand book of Bio-Medical Instrumentation ”. TMH.II Edition., 2003.					
2. M.Arumugam. “ Bio-Medical Instrumentation. ” Anuradha Agencies.1992.					
Web Resources:					
1. https://www.youtube.com/watch?v=i2mZylgP1Fk					
2. https://www.youtube.com/watch?v=4ldv98F7Zng					
3. https://nptel.ac.in/courses/108/105/108105101/					
4. https://nptel.ac.in/courses/108/105/108105091/					

EXPECTED COURSE OUTCOME	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1: Understand the Concept of bio-potential	K3
CO2: Understand the concept of biomedical signals and electrodes.	K3
CO3: Analyze the types of biomedical recorders.	K4
CO4: Understand the concepts of diagnostic equipment	K3
CO5: Analyze the modern imaging systems.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	BIOPOTENTIALS Introduction - Tissues, Muscles and Nervous System-Cellular fluids, Transmembrane potential- action potentials - Generation & Characteristics - Physiological - transducers, Biosensors, Smart sensors.	06	Chalk & Talk
II	BIOELECTRIC SIGNALS AND ELECTRODES: Origin of bioelectrical signals – Recording electrodes – Skin contact – Impedance – Electrodes for ECG – EMG and EEG – Electrical conductivity of electrodes- jellies creams microelectrodes.	06	Chalk & Talk
III	BIOMEDICAL RECORDERS AND PATIENTS MONITORING SYSTEMS: Block diagram and signal analysis of phonocardiography - Electroencephalograph. – Electromyography – Measurement of heart rate – Measurement of blood pressure –Measurement of blood flow and cardiac output – Measurement of temperature – Measurement of respiration rate.	06	Chalk & Talk
IV	THERAPEUTIC EQUIPMENTS: Cardiac pacemaker - Cardiac defibrillators – Surgical diathermy – software diathermy – Microwave diathermy- ultrasonic therapy unit – Pain relief therapy electrical stimulation.	06	Power point presentation
V	MODERN IMAGING SYSTEMS Computer X ray machine - X ray computer tomography – Basic NMR components – Echocardiography - Thermography equipment.	06	Power point presentation

Course Designed by: Dr.G.Pandeeswari

Mr.A.Velmurugan

SIXTH SEMESTER



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	8051 MICROCONTROLLER AND EMBEDDED SYSTEMS				
Course Code	21UELC61	L	P	C	
Category	Core	6	-	5	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP		
Course Objectives:					
1.To Study the architecture and addressing modes of 8051					
2. To impart knowledge about assembly language programs of 8051					
3. Helps to understand the importance of different peripheral devices & their interfacing to 8051.					
4. To impart knowledge of Interfacing with microcontroller 8051.					
5. To understand the real time application of 8051.					
Unit: I	Microcontroller Overview and Instruction set				18
Microcontrollers and Embedded Processors – Microcontrollers for Embedded Systems – Overview of 8051 Family – 8051 Instruction Set and Registers.					
Unit: II	ASSEMBLY PROGRAMMING & ADDRESSING MODES				18
Introduction to 8051 Assembly Programming – The Program Counter and ROM – Data Types and Directives – Flag Bits and PSW Register – Register Bank and Stack – Loop and Jump Instructions – I/O Port Programming – Addressing Modes.					
Unit: III	ARITHMETIC AND LOGICAL OPERATIONS IN ALP & C				18
Arithmetic Instructions and Programs – Unsigned Addition and Subtraction and Unsigned Multiplication and Division – Logic Instructions and Programs – Single Bit Instructions and Programming. Programming with C: Data Types – Time Delay Programming – I/O Programming – Logic Operations Arithmetic Operations					
Unit: IV	8051 INTERRUPTS & PERIPHERALS				18
Basic Registers of Timer – Programming 8051 Timer – Counter Programming – Basics of Serial Communication – 8051 Connection to RS 232 and RS 485 - 8051 Serial Communication Programming – 8051 Interrupts – Programming External Hardware Interrupts					
Unit: V	REAL WORLD APPLICATIONS				18
Interfacing LCD to the 8051 – Interfacing ADC – Interfacing Sensors to 8051 – Interfacing Stepper Motor – 8051 Interfacing to the Keyboard – Interfacing DAC to the 8051					
Total Lecture Hours					90 Hrs
Books for Study:					
1. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems Using Assembly and C”, PHI, 2nd edition 2006					
2. Kenneth J. Ayala, “The 8051 Microcontroller Architecture, Programming and Application” 2 nd Edition, Penram International Publications					

Books for References:

1. Mykepredko, “Programming and Customizing the 8051 Microcontroller”, Tata McGraw Hill, 1st Edition
2. Ayala J.K., —The 8051 Microcontroller: Architecture, programming and applications”, Penram International (2005) 3rd edition.

Web Resources:

<https://www.youtube.com/watch?v=84YUQu8tE4w>

https://www.youtube.com/watch?v=GPz_mR7Flas

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

EXPECTED COURSE OUTCOME

Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1: Describe architecture and operation of Microcontroller 8051	K3
CO2: Foster ability to understand the design concept of interfacing Microcontroller with various Peripherals	K3
CO3: Apply the concepts of interfacing techniques	K4
CO4: Foster ability to understand the role of PIC Microcontroller in industry	K4
CO5: Importance of the features and functional description of ARM microcontroller.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	3	1
CO 2	2	2	2	2	3	3
CO 3	2	3	3	3	1	3
CO 4	3	2	1	2	2	2
CO5	2	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	MICROCONTROLLER OVERVIEW Microcontrollers and Embedded Processors – Microcontrollers for Embedded Systems – Overview of 8051 Family – 8051 Instruction Set and Registers.	18	Chalk & Talk
II	ASSEMBLY PROGRAMMING & ADDRESSING MODES Introduction to 8051 Assembly Programming – The Program Counter and ROM – Data Types and Directives – Flag Bits and PSW Register – Register Bank and Stack – Loop and Jump Instructions – I/O Port Programming – Addressing Modes.	18	Chalk & Talk
III	ARITHMETIC AND LOGICAL OPERATIONS IN ALP & C Arithmetic Instructions and Programs – Unsigned Addition and Subtraction and Unsigned Multiplication and Division – Logic Instructions and Programs – Single Bit Instructions and Programming. Programming with C: Data Types – Time Delay Programming – I/O Programming – Logic Operations Arithmetic Operations	18	Chalk & Talk
IV	8051 INTERRUPTS & PERIPHERALS Basic Registers of Timer – Programming 8051 Timer – Counter Programming – Basics of Serial Communication – 8051 Connection to RS 232 and RS 485 - 8051 Serial Communication Programming – 8051 Interrupts – Programming External Hardware Interrupts	18	Power point presentation
V	REAL WORLD APPLICATIONS Interfacing LCD to the 8051 – Interfacing ADC – Interfacing Sensors to 8051 – Interfacing Stepper Motor – 8051 Interfacing to the Keyboard – Interfacing DAC to the 8051	18	Power point presentation

**Course Designed by: Dr.G.Pandeeswari
Mr.A.Velmurugan**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	PROJECT AND VIVA - VOCE				
Course Code	21UELPR1	L	P	C	
Category	Core	-	6	4	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> To provide knowledge of Electronics components and soldering techniques and its package information for electronics circuit design. Knowledge for the assembling of electronics circuit with components on PCB (Printed Circuit Board) of circuit design. Design and development of small electronic projects based on hardware and software for electronics systems. To enhance the knowledge on advanced Electronics Projects. To enhance technical skills to get adapted in industries. 					

EXPECTED COURSE OUTCOME		K Level
On the successful completion of the course, student will be able to:		
CO1:	Demonstrate a technical knowledge of their selected project topic	K4
CO2:	Undertake problem identification, formulation and solution	K4
CO3:	Design engineering solutions to complex problems utilizing a system approach	K4
CO4:	Conduct an engineering project	K4
CO5:	Demonstrate the knowledge, skills and attitudes of a professional electronics students	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	3	1
CO 2	2	2	2	2	3	3
CO 3	2	3	3	3	1	3
CO 4	3	2	1	2	2	2
CO5	2	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	8051 MICROCONTROLLER AND EMBEDDED SYSTEMS LAB				
Course Code	21UELCP7	L	P	C	
Category	Core	-	3	2	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED		ENTREPRENEURSHIP	
Course Objectives:					
1. To introduces the assembly language programming of Microcontroller					
2. To develop the assembly language program of Microcontroller using data transfer instruction.					
3. To develop the assembly language program of Microcontroller using arithmetic instruction					
4. To develop the assembly language program of Microcontroller using branch instruction					
5. To develop the student's C and C++ language programming skills and gives practical training of interfacing the peripheral devices with the Microcontroller					

List of Experiment

1. Addition / Subtraction of 8 / 16 bit Data
2. Multiplication / division 8 bit Data
3. Block Data Transfer
4. Smallest / Largest of N Numbers
5. BCD Addition and Subtraction
6. To Arrange in Ascending / Descending Order
7. Sum of N 8 bit Numbers
8. 1's and 2's Compliment of an Array (8 / 16bit)
9. UP/DOWN Counter using 7 Segment Display
10. Traffic Light Control Interface
11. Wave Form Generation
12. ADC Interface
13. DAC Interface
14. Stepper Motor Interface
15. Solid State Relay Interface
16. DC Motor Interface
17. Temperature Controller
18. Rolling and Blinking of a Message
19. LCD Interface
20. Frequency Counter
21. Interface with LED.

Web Resources:		
https://www.vlab.co.in/ba-nptel-labs-electronics-and-communications		
EXPECTED COURSE OUTCOME	K Level	
On the successful completion of the course, student will be able to:		
CO1:	Apply the fundamentals of assembly level programming of microcontroller	K4
CO2:	Design and Develop program for real time interface	K4
CO3:	Understand the array arrangement in memory cells	K4
CO4:	Analyze the sensors output and motor control	K4
CO5:	Design and develop embedded c program for input and output interfacing	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	2	1	2	1	3	1
CO 2	2	2	2	2	3	3
CO 3	2	3	3	3	1	3
CO 4	3	2	1	2	2	2
CO5	2	2	3	2	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	1. Addition / Subtraction of 8 / 16 bit Data 2. Multiplication / division 8 bit Data 3. Block Data Transfer 4. Smallest / Largest of N Numbers	9	Practical
II	5. To Arrange in Ascending / Descending Order 6. Sum of N 8 bit Numbers 7. 1's and 2's Compliment of an Array (8 / 16bit) 8. UP/DOWN Counter using 7 Segment Display	9	Practical
III	9. Traffic Light Control Interface 10. Wave Form Generation 11. ADC Interface 12. DAC Interface	9	Practical
IV	13. Stepper Motor Interface 14. Solid State Relay Interface 15. DC Motor Interface 16. Temperature Controller	9	Practical
V	17. Rolling and Blinking of a Message 18. LCD Interface 19. Frequency Counter 20. Water Level Indicator	9	Practical

Course Designed by: Mr.J.Charles theodore, Dr.D.Sivaranjani.



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	SENSORS AND TRANSDUCERS LAB			
Course Code	21UELCP8	L	P	C
Category	Core	-	3	2
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP	
Course Objectives:				
<ol style="list-style-type: none"> To study the Characteristics of temperature sensors. To study the characteristics of displacement sensors. To study the characteristics of Vibration measurement transducers. To study the characteristics of switching devices used in industries. To develop and design the sensor based Application experiments 				

List of Experiment

- Study of RTD, Thermistor characteristics.
- Study of Thermocouples characteristics and cold junction compensation.
- Study of IC Temperature sensors.
- Study of Strain gauge and Load cell characteristics.
- Study of LVDT and Tacho generator characteristics.
- LDR and Opto-coupler characteristics.
- Study of Piezo-electric transducers and vibration measurement using Piezo electric transducer.
- PLL application circuits, Frequency multiplier.
- Study of UJT, IGBT devices.
- Speed control of AC/DC Motors using Thyristor.
- Design and testing of FET input volt meter.
- Phase sensitive detectors.

Web Resources:

<https://sl-coep.vlabs.ac.in/>

EXPECTED COURSE OUTCOME		K Level
On the successful completion of the course, student will be able to:		
CO1:	Study the basic concepts of Transducers	K4
CO2:	Construct and study the Temperature transducers	K4
CO3:	Construct and study the Displacement transducers	K4
CO4:	Design the ADC & DAC circuits and study its operation	K4
CO5:	Design PLL and UJT relaxation oscillator	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Study of RTD, Thermistor characteristics.	9	Practical
	Study of Thermocouples characteristics and cold junction compensation.		
II	Study of IC Temperature sensors	9	Practical
	Study of Strain gauge and Load cell characteristics		
III	Study of LVDT and Tacho generator characteristics.	9	Practical
	LDR and Opto-coupler characteristics		
IV	Study of Piezo-electric transducers and vibration measurement using Piezo electric transducer.	9	Practical
	PLL application circuits, Frequency multiplier		
V	Study of UJT, IGBT devices.	9	Practical
	Speed control of AC/DC Motors using Thyristor.		
	Design and testing of FET input volt meter		
	Phase sensitive detectors.		

**Course Designed by: Dr.G.Pandeeswari
Mr.A.Velmurugan**



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	SATELLITE COMMUNICATION				
Course Code	21UELE61	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY ✓	SKILL ORIENTED	ENTREPRENEURSHIP		
Course Objectives:					
<ol style="list-style-type: none"> 1. To provide knowledge on fundamentals of Satellite Communication. 2. To understand the concepts of satellite orbits.. 3. To enhance the knowledge on space segments. 4. To gain on linkage of satellite designs. 5. To apply the concepts of communication in satellite. 					
Unit: I	Satellite Systems – Overview				15
Introduction- Basic concepts of Satellite communications- Frequency allocations for satellite systems. Advantages and applications of satellite communications over other communications.					
Unit: II	Orbital Aspects Of Satellite Systems				15
Orbital Mechanics- look angle determination- orbit perturbations- Orbital determination- launches and launch vehicles- orbital effects in communication systems performance.					
Unit: III	The Space Segment				15
Introduction- spacecraft subsystems- attitude and orbit control systems- Telemetry- tracking and command- power systems- communication subsystems.					
Unit: IV	Satellite Link Design				15
Satellite Link Design					
Basic transmission theory- system noise temperature and G/T ratio- Design of down links- up link design- design of satellite link for specified C/N.					
Unit: V	Applications Of Satellite Systems				15
INTELSAT Series- INSAT- VSAT- GSM- GPS- INMARSAT-Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH)- Digital audio broadcast (DAB)- World space services- Business TV(BTV)- GRAMSAT.					
Total Lecture Hours					75 Hrs
Books for Study:					
<ol style="list-style-type: none"> 1. Timothy Pratt, Charles Bostian,JeremyAllnutt, Satellite Communications, 2nd edition, John willey 2006. 2. W. L. Pritchard, H. G. Suyderhoud and R. A. Nelson, Satellite Communication Systems Engineering, 2nd edition, Pearson educational p blishers, New Delhi, 2003. 					
Books for References:					
<ol style="list-style-type: none"> 1. Dennis Roddy, Satellite Communications, 3rd edition, McGraw Hill, International, 2001. 2. Dr D.C. Agarwal, Satellite Communications, 4th edition, Khanna Publications, New Delhi, 2001. 					

Web Resources	
1. https://nptel.ac.in/courses/117/105/117105131/	
2. https://www.youtube.com/watch?v=hXa3bTclGPU	
3. https://www.youtube.com/watch?v=Bvj1BpP4zU8	
EXPECTED COURSE OUTCOME	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Gain knowledge on Satellite Communication and frequency allocations. K3
CO2:	Able to analyze satellite mechanism and system performance. K3
CO3:	Gain the knowledge on space craft subsystems and TT&C. K4
CO4:	Understand the theory of transmission. K4
CO5:	Understand the applications of various satellite systems. K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Satellite Systems – Overview Introduction- Basic concepts of Satellite communications- Frequency allocations for satellite systems. Advantages and applications of satellite communications over other communications.	15	Chalk & Talk
II	Orbital Aspects Of Satellite Systems Orbital Mechanics- look angle determination- orbit perturbations- Orbital determination- launches and launch vehicles- orbital effects in communication systems performance	15	Chalk & Talk
III	The Space Segment Introduction- spacecraft subsystems- attitude and orbit control systems- Telemetry- tracking and command- power systems- communication subsystems.	15	Chalk & Talk
IV	Satellite Link Design Basic transmission theory- system noise temperature and G/T ratio- Design of down links- up link design- design of satellite link for specified C/N	15	Power point presentation
V	Applications Of Satellite Systems INTELSAT Series- INSAT- VSAT- GSM- GPS- INMARSAT- Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH)- Digital audio broadcast (DAB)- World space services- Business TV(BTV)- GRAMSAT	15	Power point presentation

**Course Designed by: Dr.D.Sivaranjani
Mr.J.Charles Theodore**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA I	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CIA II	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q. No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	DIGITAL SIGNAL PROCESSING				
Course Code	21UELE62	L	P	C	
Category	Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1.To understand the concepts of Discrete- time-system and Z-transform					
2. To understand the design of digital filter					
3. To understand the concept of errors in digital system					
4. To understand the concept of realization structure of FIR & IIR filters.					
5. To understand the concept of FFT algorithm.					
Unit: I	Discrete time system				15
Introduction – Block diagram representation of discrete time system. Classification of discrete time system – Static versus dynamic system – Time invariant versus time variant system – Linear versus Nonlinear system – Causal versus Non causal systems – Stable versus unstable systems. Z-transform: Definition of Z transforms – Inverse Z transform – Properties of Z transform					
Unit: II	Design of digital filter				15
Design of linear phase FIR filter using windows – IIR filter design: -impulse invariant method-bilinear transformation method – Review of design technique for analog low pass filter.					
Unit: III	Realization of digital linear system:				15
Basic Structure for FIR system: Direct form – cascade form Basic Structure for IIR system: Direct form -Cascade form structure- Parallel structure-Ladder structure.					
Unit: IV	Discrete Fourier transform:				15
Discrete Fourier transform: Definition and properties. FFT algorithm: Introduction to radix 2 fast Fourier transforms – Decimation in time FFT - Decimation in frequency FFT.					
Unit: V	Finite word length Effects in digital filters:				15
Types of Number representation-Quantization noise- Truncation and rounding -quantization error - overflow limit cycle oscillation.					
Total Lecture Hours					75 Hrs
Books for Study:					
1. S.Salivahanan. A. Vallavaraj and C.GnanaPriya, Digital signal and processing ,Tata McGraw-Hill publishing company, New Delhi, First Edition, 2001.					
2. John G.proakisnandD.G.Manolakis,” Digital signal and processing ”PHI, 1986.					
3. P. Rameshbabu,” Digital signal and processing ”, fourth edition Scitech 2007.					
Books for References:					
1. P. Ramesh Babu, Digital Signal Processing ,SciTech Publications, Chennai,Fourth Edition 2007.					
2. Johny R Johnson, Introduction to Digital Signal Processing , Pearson Education, New Delhi, 2015.					

Web Resources	
1.	https://nptel.ac.in/courses/108/106/108106151/
2.	https://swayam-uat-node1.appspot.com/practice_course1/preview
3.	https://www.mooc-list.com/tags/digital-signal-processing
EXPECTED COURSE OUTCOME	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1:	Understand Digital Signal Controllers and their Applications K3
CO2:	Design digital filters IIR and FIR filters K3
CO3:	Develop discrete form and cascade form of FIR and IIR system K4
CO4:	Analyze the concept of FFT and DFT K4
CO5:	Evaluate finite word length effects in signal processing K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Z-transform: Definition of Z transforms – Inverse Z transform – Properties of Z transform. Discrete time system: Introduction – Block diagram representation of discrete time system. Classification of discrete time system – Static versus dynamic system – Time invariant versus time variant system – Linear versus Nonlinear system – Causal versus Non causal systems – Stable versus unstable systems.	15	Chalk & Talk
II	Design of digital filter: Design of linear phase FIR filter using windows – IIR filter design: -impulse invariant method- bilinear transformation method – Review of design technique for analog low pass filter.	15	Chalk & Talk
III	Realization of digital linear system: Basic Structure for FIR system: Direct form – cascade form Basic Structure for IIR system: Direct form -Cascade form structure- Parallel structure-Ladder structure.	15	Chalk & Talk
IV	Discrete Fourier transform: Definition and properties. FFT algorithm: Introduction to radix 2 fast Fourier transforms – Decimation in time FFT - Decimation in frequency FFT.	15	Power point presentation
V	Finite word length Effects in digital filters: Types of Number representation-Quantization noise- Truncation and rounding -quantization error -overflow limit cycle oscillation.	15	Power point presentation

Course Designed by: **Dr.G.Pandeeswari, Mr.A.Velmurugan**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI AI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI AII	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q. No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	ROBOTICS				
Course Code	21UELE63	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> 1. To familiarize the students with the fundamental concepts of Robots. 2. To understand the various concepts of Drives and Control systems. 3. Gain knowledge on types of sensors and Vision Systems Robots. 4. To understand the Robot end effectors 5. To understand the concepts of Robot Motion analysis and control. 					
Unit: I	Robotic Systems				15
Basic Structure of Robots – Accuracy, Resolution and Repeatability of Robot – Classification: Point to Point Robotic System – Continuous Path Robotic System - Cartesian – Cylindrical – Spherical - Articulated Robots					
Unit: II	Drives and Control Systems				15
Hydraulic Systems - Hydraulic Motor – DC Servo Motors – Stepper Motor – Control Loops using Current Amplifier - Control Loops using Voltage Amplifier.					
Unit: III	Sensors and Vision Systems				15
Sensors: Transducers and Sensors – Tactile Sensors – Proximity and Range Sensors – Vision Systems: Image Processing and Analysis – Image Data Reduction – Segmentation – Feature Extraction – Object Recognition by Raspberry Pi and Jetson Nano.					
Unit: IV	Robot End Effectors				15
Types of end Effectors – Mechanical Grippers: Types of Gripper Mechanisms – Vacuum Cups – Magnetic Grippers – Adhesive Grippers – Robot end Effector Interface.					
Unit: V	Robot Motion Analysis and Control				15
Introduction to Manipulator Kinematics – Robot Dynamics – Configuration of a Robot Controller – Hierarchical Computer Control – Flexible Manufacturing Systems – Head Changing Application of Robots – Application in Welding, Painting and Assembly.					
Total Lecture Hours					75 Hrs
Books for Study:					
<ol style="list-style-type: none"> 1. M.P.Groover, Mitchellweiss, Roger.N.Nagel, NicholasG.Odrey, Industrial Robotics– Technology, Programming And Application , McGraw-Hill, 2008. 2. Ghosh, —Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998. 					
Books for References:					
<ol style="list-style-type: none"> 1. Deb. S.R., —Robotics Technology And Flexible Automation , John Wiley, USA 1992. 2. Klafter R.D., Chimielewski T.A., Negin M., —Robotic Engineering – An integrated approach , Prentice Hall of India, New Delhi, 1994 					
Web Resources					
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/112/105/112105249/Introduction to Robots 2. https://nptel.ac.in/courses/112/101/112101098/Robotics and Automation 					

EXPECTED COURSE OUTCOME	
Course Outcomes	K Level
On the successful completion of the course, student will be able to:	
CO1: Scribe the working concept and types of Robots	K3
CO2: Apply the knowledge of types of sensors and actuators	K3
CO3: Programming Languages for Robot design models	K4
CO4: Understand the concept of Mobile Robotic Locomotion	K4
CO5: Study the various applications of Robots	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Robotic Systems Basic Structure of Robots – Accuracy, Resolution and Repeatability of Robot – Classification: Point to Point Robotic System – Continuous Path Robotic System - Cartesian – Cylindrical – Spherical - Articulated Robots	15	Chalk & Talk
II	Drives and Control Systems Hydraulic Systems - Hydraulic Motor – DC Servo Motors – Stepper Motor – Control Loops using Current Amplifier - Control Loops using Voltage Amplifier.	15	Chalk & Talk
III	Sensors and Vision Systems Sensors: Transducers and Sensors – Tactile Sensors – Proximity and Range Sensors – Vision Systems: Image Processing and Analysis – Image Data Reduction – Segmentation – Feature Extraction – Object Recognition by Rasbperry Pi and Jetson Nano.	15	Chalk & Talk
IV	Robot End Effectors Types of end Effectors – Mechanical Grippers: Types of Gripper Mechanisms – Vacuum Cups – Magnetic Grippers – Adhesive Grippers – Robot end Effector Interface.	15	Power point presentation
V	Robot Motion Analysis and Control Introduction to Manipulator Kinematics – Robot Dynamics – Configuration of a Robot Controller – Hierarchical Computer Control – Flexible Manufacturing Systems – Head Changing Application of Robots – Application in Welding, Painting and Assembly.	15	Power point presentation

Course Designed by: **Dr.D.Sivaranjani, Dr.G.Pandeeswari.**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA I	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CIA II	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S. No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q. No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q. No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q. No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q. No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	VLSI DESIGN				
Course Code	21UELE64	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
<ol style="list-style-type: none"> To provide knowledge on VLSI fabrications. To understand the electrical properties of MOS Devices. To understand the design rules for layout diagrams. To gain knowledge on VLSI physical design and styles. To gain knowledge to apply test principles. 					
Unit: I	VLSI Technology				15
Fabrication sequence – process flow – Testing – Super integration concepts – Integrated Passive components – MOS Resistors and capacitors – Crossovers – NMOS – PMOS – CMOS – BICMOS fabrication processes – comparison					
Unit: II	Electrical Properties of MOS Devices				15
Drain to source current (I_{ds}) versus Drain to source voltage (V_{ds}) relationships – MOS transistor threshold voltage (V_t) – MOS transistor trans-conductance g_m and output conductance g_{ds} – figure of merit (ω_0) – pass transistor- pull – up to pull – down ratio.					
Unit: III	Design Processes				15
VLSI design flow - stick diagram design rules with examples - Design rules for Layout diagrams of digital circuits– sheet resistance R_s –standard unit of capacitance – Inverter delays – Propagation delays- scaling of MOS circuits – limitations of scaling.					
Unit: IV	VLSI Physical Design And Styles				15
Physical Design: Floor Planning – Placement – Routing – Power Delay Estimation – Clock Routing – Power Routing.					
VLSI Design Styles: Full Custom – Semi custom – Standard Cells – Gate Arrays – FPGAs – CPLDs.					
Unit: V	Testing Of VLSI Circuits				15
Test Principles-BIST-Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques.					
Total Lecture Hours					75 Hrs
Books for Study:					
<ol style="list-style-type: none"> Basic VLSI Design, Douglas, 3rd Edition, A. Pucknell, Kamran Eshraghian, PHI, New Delhi, 2011. Modern VLSI design, Wayne Wolf, 3rdEdition, Pearson Education, New Delhi, 4th impression 2008. 					
Books for References:					
<ol style="list-style-type: none"> Introduction to VLSI Circuits and Systems, John .P. Uyemura, John Wiley, Student Edition, New Delhi, Reprint 2006. Principles of CMOS VLSI Design, N.H.E Weste ,K.Eshraghian, Adisson Wesley, 2nd Edition, 					

New Delhi.

3. **Application Specific Integrated Circuits**, Michel John Sebastian Smith, Addison Wesley, Indian Edition, 4th Indian Reprint 2001, New Delhi

Web Resources

1. <https://nptel.ac.in/courses/117/101/117101058/>
2. <https://www.youtube.com/watch?v=9SnR3M3CI4>
3. <https://www.youtube.com/watch?v=Y8FvzcocT4>

EXPECTED COURSE OUTCOME

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Gain the knowledge on fabrication principles.	K3
CO2:	Able to analyze the electrical properties of MOS transistors.	K3
CO3:	Apply the appropriate layout design rule to create a VLSI layout for a design.	K4
CO4:	Understand the physical design steps and gain the knowledge on types of VLSI design styles	K4
CO5:	Gain the knowledge, analyze and apply test principles to evaluate the VLSI designs.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	VLSI Technology Fabrication sequence – process flow – Testing – Super integration concepts – Integrated Passive components – MOS Resistors and capacitors – Crossovers – NMOS – PMOS – CMOS – BICMOS fabrication processes – comparison.	15	Chalk & Talk
II	Electrical Properties of MOS Devices Drain to source current (I_{ds}) versus Drain to source voltage (V_{ds}) relationships – MOS transistor threshold voltage (V_t) – MOS transistor trans-conductance g_m and output conductance g_{ds} – figure of merit (ω_0) – pass transistor- pull – up to pull – down ratio.	15	Chalk & Talk
III	Design Processes VLSI design flow - stick diagram design rules with examples - Design rules for Layout diagrams of digital circuits– sheet resistance R_s –standard unit of capacitance – Inverter delays – Propagation delays- scaling of MOS circuits – limitations of scaling.	15	Chalk & Talk
IV	VLSI Physical Design And Styles Physical Design: Floor Planning – Placement – Routing – Power Delay Estimation – Clock Routing – Power Routing. VLSI Design Styles: Full Custom – Semi custom – Standard Cells – Gate Arrays – FPGAs – CPLDs.	15	Power point presentation
V	Testing Of VLSI Circuits Test Principles-BIST-Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques.	15	Power point presentation

**Course Designed by: Mr.A.Velmurugan
Dr.G.Pandeeswari.**

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	MODERN TELEVISION SYSTEM			
Course Code	21UELE65	L	P	C
Category	Core Elective	5	-	5
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP
Course Objectives:				
<ol style="list-style-type: none"> 1. To impart the knowledge on fundamentals of Television. 2. To understand the principles of transmitter and receiver. 3. To acquire the knowledge of the essentials of colour television. 4. To understand different types of Colour TV systems. 5. To gain knowledge on Advanced Television systems. 				
Unit: I	Fundamentals Of Television			15
Aspect ratio - Number of scanning lines – Scanning -Interlaced scanning --Composite video signal - VSB transmission – Complete channel width –VSB reception -TV standards- Compatibility with Monochrome and Color TV and vice-versa				
Unit: II	Camera Tubes & TV Transmitter			15
Camera Tubes Characteristics – Types of camera tube – photoconductive and photoemissive principles – Construction and working of Vidicon and Plumbicon camera tubes.				
TV Transmitter Block diagram of TV Transmitter- Visual exciter- Aural exciter- Diplexer				
Unit: III	Essentials of Color Television and Systems			15
Three color theory - Luminance, Hue and saturation - Color television cameras -Values of luminance and color difference signals. NTSC color TV systems - SECAM system - PAL color TV systems.				
Unit: IV	Television Receiver			15
Block diagram-Tuners-IF and RF stages-Wave trap circuits- Video detector-DC restoration- Sync separator-Vertical and Horizontal Systems-Vertical Output stage- EHT generation				
Unit: V	Modern Television Systems			15
Concepts of LCD, LED, Plasma TVs- 4K-O LED- Q LED TV-Cable TV- DTH.				
Total Lecture Hours				75 Hrs
Books for Study:				
<ol style="list-style-type: none"> 1. R.R.Gulati, —Monochrome Television Practice, Principles, Technology And Servicing. Third Edition 2006, New Age International (P) Publishers. 2. R.R.Gulati, Monochrome & Color Television”, New Age International Publisher, 2003. 				
Books for References:				
<ol style="list-style-type: none"> 1. A.M Dhake, —Television and Video Engineering”, 2nd ed., TMH, 2003. 2. R.P.Bali, —Color Television, Theory and Practicel, Tata McGraw-Hill, 1994 				
Web Resources				
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/117/102/117102059/Introduction to communication 2. https://www.youtube.com/watch?reload=9&v=EAybx dgS2T4TV Transmission 				
EXPECTED COURSE OUTCOME				

Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Acquire knowledge on television fundamentals.	K3
CO2:	Study on Transmitter and receiver standards	K3
CO3:	Understand the Picture tube of color TV	K4
CO4:	Knowledge on performance of Color TV systems.	K4
CO5:	Familiarize Advanced TV Systems	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Fundamentals Of Television Aspect ratio - Number of scanning lines – Scanning -Interlaced scanning --Composite video signal - VSB transmission – Complete channel width –VSB reception -TV standards- Compatibility with Monochrome and Colour tv and vice-versa	15	Chalk & Talk
II	Camera Tubes & TV Transmitter Camera Tubes Characteristics – Types of camera tube – photoconductive and photoemissive principles – Construction and working of Vidicon and Plumbicon camera tubes. TV Transmitter Block diagram of TV Transmitter- Visual exciter- Aural exciter- Diplexer	15	Chalk & Talk
III	Essentials of Color Television and Systems Three colour theory - Luminance, Hue and saturation - Colour television cameras -Values of luminance and colour difference signals.NTSC colour TV systems - SECAM system - PAL colour TV systems.	15	Chalk & Talk
IV	Television Receiver Block diagram-Tuners-IF and RF stages-Wave trap circuits- Video detector-DC restoration- Sync separator-Vertical and Horizontal Systems-Vertical Output stage- EHT generation.	15	Power point presentation
V	Advanced Television Systems Concepts of LCD, LED, Plasma TVs- 4K-O LED- Q LED TV-Cable TV- DTH.	15	Power point presentation

Course Designed by: Dr.D.Sivaranjani, Dr.G.Pandeeswari.

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CIA I	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CIA II	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	SENSORS AND MEASUREMENTS				
Course Code	21UELE66	L	P	C	
Category	Core Elective	5	-	5	
Nature of course:	EMPLOYABILITY	SKILL ORIENTED	✓	ENTREPRENEURSHIP	
Course Objectives:					
1. To familiarize the students with the knowledge of transducers and its types. 2. To understand the operation of Displacement and Strain gauges. 3. To understand the working principles of Pressure and vibration sensors. 4. To gain knowledge about flow sensors. 5. To understand the working of flow, force and torque sensors.					
Unit: I	Transducer classification and Temperature sensor				15
Introduction - Electrical transducer - classification-basic requirement - Mechanical temperature sensors - resistive type - platinum resistance thermometer-thermistors - Quartz thermometer - radiation method - optical pyrometer.					
Unit: II	Displacement and Strain Sensor				15
Principle of transduction-digital transducer-level measurements Introduction-factors affecting strain measurement-types of strain gauge-theory of operation of resistance strain gauge-types of electrical strain gauge-gauge techniques and other factors					
Unit: III	Vibration and pressure Sensor				15
Introduction - characteristics- analysis of vibration sensing device-vibration sensing devices-signal conditioners-shock measurement. Pressure Introduction-diaphragms-piezoelectric pressure transducer-vibrating element pressure sensors – 4 to 20 mA – 0 to 10 V Measurements for Industry.					
Unit: IV	Flow Sensor				15
Introduction-classification-head type flow meter-rotameter-electromagnetic flow meter-mechanical flow meter-Anemometer-ultrasonic flow meter.					
Unit: V	Force and Torque Sensor				15
Introduction - force measuring sensor-load cell elastic transducer-digital force transducer-hydraulic load cell-electronic weighing system-torque measurement					
Total Lecture Hours					75 Hrs
Books for Study:					
1. C.S.Rangan,G R Sarma VSV mani” Instrumentation devices & systems , Tata Mcgraw hill publishing company private ltd, Delhi 2nd edition,					
Books for References:					
1. D.Patranabi, Sensors and Transducers ,PHI Learning Pvt.Ltd, New Jersey,Second Edition,2003. 2. Lan Sinclair, Sensors and Transducers ,Newnes,Copyright,OxfordUniversity,U.K, Third Edition					
Web Resources					

1. <https://www.youtube.com/watch?v=1uPTyJxZzyo>
2. <https://www.youtube.com/watch?v=q8UuRkOQ9A0>
3. <https://www.youtube.com/watch?v=nv3GuJARjNU>

EXPECTED COURSE OUTCOME		K Level
Course Outcomes		K Level
On the successful completion of the course, student will be able to:		
CO1:	Remembering the concept of a transducer	K3
CO2:	Understand the principle of displacement and strain gauge techniques	K3
CO3:	Identify the concept of pressure sensors.	K4
CO4:	Classify types of flow meters.	K4
CO5:	Evaluate force and torque of sensors and transducers	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	3	2	2	2	3
CO 2	3	2	2	2	2	3
CO 3	3	3	3	2	2	1
CO 4	2	2	2	3	3	1
CO5	2	2	3	3	2	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

Unit	Course Name	Hrs	Pedagogy
I	Introduction - Electrical transducer - classification-basic requirement - Mechanical temperature sensors - resistive type - platinum resistance thermometer-thermistors - Quartz thermometer -radiation method optical pyrometer.	15	Chalk & Talk
II	Principle of transduction-digital transducer-level measurements Introduction-factors affecting strain measurement-types of strain gauge-theory of operation of resistance strain gauge-types of electrical strain gauge-gauge techniques and other factors	15	Chalk & Talk
III	Introduction - characteristics- analysis of vibration sensing device- vibration sensing devices-signal conditioners-shock measurement. Pressure Introduction-diaphragms-piezoelectric pressure transducer-vibrating element pressure sensors – 4 to 20 mA – 0 to 10 V Measurements for Industry.	15	Chalk & Talk
IV	Introduction-classification-head type flow meter-rotameter-electromagnetic flow meter-mechanical flow meter-Anemometer-ultrasonic flow meter.	15	Power point presentation
V	Force and Torque Introduction - force measuring sensor-load cell elastic transducer-digital force transducer-hydraulic load cell-electronic weighting system-torque measurement	15	Power point presentation

Course Designed by: Mr.A.Velmurugan.

Mr.J.Charles Theodore

Learning Outcome Based Education & Assessment (LOBE)								
Formative Examination - Blue Print								
Articulation Mapping – K Levels with Course Outcomes (COs)								
Internal	Cos	K Level	Section A		Section B		Section C Either or Choice	Section D Open Choice
			MCQs		Short Answers			
			No. of Questions	K - Level	No. of Questions	K - Level		
CI	CO1	Up to K3	2	K1&K2	1	K2	2(K3, K3)	1(K3)
AI	CO2	Up to K3	2	K1&K2	2	K2	2(K3, K3)	1(K3)
CI	CO3	Up to K4	2	K1&K2	1	K2	2(K3, K3)	1(K4)
AI	CO4	Up to K4	2	K1&K2	2	K2	2(K3, K3)	1(K3)
Question Pattern CIA I & II		No. of Questions to be asked	4		3		4	2
		No. of Questions to be answered	4		3		2	1
		Marks for each question	1		2		5	10
		Total Marks for each section	4		6		10	10

Distribution of Marks with K Level CIA I & CIA II								
	K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either / Or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidate of %
CIA I	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	20	40	80	80
	K4	-	-	-	-	-	-	-
	Marks	4	6	20	20	50	100	100
CIA II	K1	2	-	-	-	2	4	20
	K2	2	6	-	-	8	16	
	K3	-	-	20	10	30	60	60
	K4	-	-	-	10	10	20	20
	Marks	4	6	20	30	60	100	100

K1- Remembering and recalling facts with specific answers

K2- Basic understanding of facts and stating main ideas with general answers

K3- Application oriented- Solving Problems

K4- Examining, analyzing, presentation and make inferences with evidences

CO5 will be allotted for individual Assignment which carries five marks as part of CIA component.

Summative Examination – Blue Print Articulation Mapping – K Level with Course Outcomes (COs)								
S.No	COs	K - Level	MCQs		Short Answers		Section C (Either / or Choice)	Section D (Open Choice)
			No. of Questions	K – Level	No. of Question	K – Level		
1	CO1	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
2	CO2	Up to K3	2	K1&K2	1	K2	2(K3&K3)	(K3)
3	CO3	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
4	CO4	Up to K4	2	K1&K2	1	K2	2(K4&K4)	(K4)
5	CO5	Up to K4	2	K1&K2	1	K2	2(K3&K3)	(K4)
No. of Questions to be Asked			10		5	5	10	5
No. of Questions to be answered			10		5		5	3
Marks for each question			1		2		5	10
Total Marks for each section			10		10		25	30
(Figures in parenthesis denotes, questions should be asked with the given K level)								

Distribution of Marks with K Level							
K Level	Section A (Multiple Choice Questions)	Section B (Short Answer Questions)	Section C (Either/ or Choice)	Section D (Open Choice)	Total Marks	% of (Marks without choice)	Consolidated %
K1	5	-	-	-	5	4.16	17
K2	5	10	-	-	15	12.5	
K3	-	-	40	20	60	50	50
K4	-	-	10	30	40	33.3	33
Marks	10	10	50	50	120	100	100
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels.							

Summative Examinations - Question Paper – Format

Section A (Multiple Choice Questions)			
Answer All Questions			(10x1=10 marks)
Q.No	CO	K Level	Questions
1	CO1	K1	
2	CO1	K2	
3	CO2	K1	
4	CO2	K2	
5	CO3	K1	
6	CO3	K2	
7	CO4	K1	
8	CO4	K2	
9	CO5	K1	
10	CO5	K2	
Section B (Short Answers)			
Answer All Questions			(5x2=10 marks)
Q.No	CO	K Level	Questions
11	CO1	K2	
12	CO2	K2	
13	CO3	K2	
14	CO4	K2	
15	CO5	K2	
Section C (Either/Or Type)			
Answer All Questions			(5 x 5 = 25 marks)
Q.No	CO	K Level	Questions
16) a	CO1	K3	
16) b	CO1	K3	
17) a	CO2	K3	
17) b	CO2	K3	
18) a	CO3	K3	
18) b	CO3	K3	
19) a	CO4	K4	
19) b	CO4	K4	
20) a	CO5	K3	
20) b	CO5	K3	
NB: Higher level of performance of the students is to be assessed by attempting higher level of K levels			
Section D (Open Choice)			
Answer Any Three questions			(3x10=30 marks)
Q.No	CO	K Level	Questions
21	CO1	K3	
22	CO2	K3	
23	CO3	K4	
24	CO4	K4	
25	CO5	K4	



MANNAR THIRUMALAI NAICKER COLLEGE (AUTONOMOUS)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION
 (For those who joined in 2021-2022 and after)

Course Name	COMPUTER NETWORKS			
Course Code	21UELS61	L	P	C
Category	Skill	2	-	2
NATURE OF COURSE:	EMPLOYABILITY	SKILL ORIENTED	ENTREPRENEURSHIP	
COURSE OBJECTIVES:				
<ul style="list-style-type: none"> • . To develop an understanding of computer networking basics. • Familiarize the student with the basic taxonomy and terminology of the computer networking area. • Identify the different types of network topologies and protocols.. • Independently understand basic computer network technology. • To know the various security services of network 				
Unit: I	Introduction:			06
Data Communication-Networks-Protocols and Standards- Network Models: Layered Tasks-The OSI Model-Layers in the OSI Model-TCP/IP Protocol suite.				
Unit: II	Physical Layer:			06
Transmission Media: Guided media- Unguided media: Wireless- Wireless WANS: Cellular Telephone and Satellite Networks –Cellular Telephony-Satellite Networks.				
Unit: III	Data Link Layer: Error Detection and Correction:			06
Introduction – Block Coding- Linear Block Codes- Cyclic Codes.				
Unit: IV	Network Layer:			06
Delivery, Forwarding and Routing: Delivery– Forwarding – Multicast Routing Protocols.				
Unit: V	Network Security:			06
Security services – Message confidentiality – Message Integrity – Message Authentication – Digital Signature – Entity Authentication.				
Total Lecture Hours				30
Books for Study:				
1. Behrouz A. Forouzan, Data Communications and Networking, TataMcGraw Hill Education Private Limited, New Delhi, Fourth Edition, 2007. Unit I : Chapter1 – Section: 1.1, 1.2, 1.4. Chapter2 – Section: 2.1- 2.4 Unit II : Chapter 7 – Section: 7.1,7.2 Chapter 16 – Section:16.1,16.2 Unit III: Chapter 10 – Section: 10.1 - 10.5 Chapter 11 – Section:11.1-11.5 Unit IV: Chapter22 – Section: 22.1, 22.2, 22.4. Unit V : Chapter 31 – Section: 31.1-31.6				
Book for References:				
1. AndrewS.Tanenbaum, Computer Network, Prentice Hall of India, New Delhi, Fifth Edition, 2014. 2. PrakashC.Gupta, Data Communications & Computer Networks, Prentice Hall of India, New Delhi, Third Edition, 2006.				

3. William Stallings, Data and Computer Communications, Prentice Hall of India, New Delhi, Seventh Edition, 2004.

Web Resources

1. <https://www.journals.elsevier.com/computer-networks>
2. https://www.tutorialspoint.com/computer_fundamentals/computer_networking.html
3. <https://www.guru99.com/types-of-computer-network.html>

EXPECTED COURSE OUTCOME		K Level
CO1:	Explain about building blocks of Computer Network, Components and Transmission media.	K3
CO2:	Demonstrate the Functionalities and Protocols in the layers of ISO/OSI Network Model.	K3
CO3:	Make use of the Data link layer protocols in Error detection and correction.	K3
CO4:	Apply Suitable Routing Strategies for a given network and choose appropriate access control, congestion control and congestion avoidance technique for given Traffic scenario	K3
CO5:	Assess the functions of Application layer Paradigms and Protocols and design for the real time applications.	K4

CO & PO Mappings:

COS	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6
CO 1	3	2	2	2	3	2
CO 2	2	2	2	2	3	2
CO 3	2	1	2	2	2	2
CO 4	2	2	2	2	1	2
CO 5	2	3	2	2	1	2

*3 – Advanced Application; 2 – Intermediate Development; 1 - Introductory Level

LESSON PLAN

UNIT	COMPUTER NETWORKS	Hrs	Mode
I	Introduction: Data Communication-Networks-Protocols and Standards- Network Models: Layered Tasks-The OSI Model-Layers in the OSI Model-TCP/IP Protocol suite.	15	Lecture, Chalk, PPT, ICT
II	Physical Layer: Transmission Media: Guided media- Unguided media: Wireless- Wireless WANS: Cellular Telephone and Satellite Networks –Cellular Telephony-Satellite Networks.	15	Lecture, Chalk, PPT, ICT
III	Data Link Layer: Error Detection and Correction: Introduction – Block Coding- Linear Block Codes- Cyclic Codes.	15	Lecture, Chalk, PPT, ICT
IV	Network Layer: Delivery, Forwarding and Routing: Delivery– Forwarding – Multicast Routing Protocols.	15	Lecture, Chalk, PPT, ICT
V	Network Security: Security services – Message confidentiality – Message Integrity – Message Authentication – Digital Signature – Entity Authentication.	15	Lecture, Chalk, PPT, ICT

Course Designed by: Dr.T.Sujithra