PERIYAR UNIVERSITY

PERIYAR PALKALAI NAGAR

SALEM – 636011

DEGREE OF MASTER OF SCIENCE

(CHOICE BASED CREDIT SYSTEM)

SYLLABUS FOR

M.Sc., ELECTRONICS AND COMMUNICATION

(SEMESTER PATTERN)

(For Candidates admitted in the Colleges affiliated to Periyar University from 2021-2022 onwards)

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: To improve the students ability to adapt to a rapidly changing environment by new skills and new competencies.

PEO 2: To promote the graduates to develop solutions to real problems in the areas of Electronics and communications.

PEO 3: To upgrade the graduates to the latest trends in technology and to pursue research to meet out the advanced developments in industries.

PEO 4: After successful completion of this course a student can pursue engineering courses like M.E/ M.Tech/M.S with good GATE Score.

PEO 5: To understand and appreciate professional ethics, community living and nation building initiatives.

PROGRAMME OUTCOMES

PO 1: Gaining the knowledge in the subject of Electronics and Communication and apply the principles of the same to the requirements of the employer or for entrepreneurship.

PO 2: Acquire in-depth knowledge in the broad area of Microcontrollers and Communication systems, with an ability to discriminate, evaluate, analyze and synthesize the acquired knowledge.

PO 3: Develop the ability to understand clearly the steps in designing communication systems which are in tune with recent technology and adaptable for future challenges.

PO 4: Learn and practice to use the engineering software, hardware, design and modeling techniques that are the latest in the field of electronics.

PO 5: Ability to design and develop practical solutions for real-time problems in the domain of Electronics and Communication.

Employment opportunities:

The students are able to get employment opportunities in the following areas,

1.IT sectors /Defense/Railways/ISRO/DRDO.

2.Electronics /Communications /Bio Medical sectors.

3.Government Telecommunication /Air Force/Navy.

REGULATIONS

1. CONDITION FOR ADMISSIONS

A candidate who has passed **B.Sc., Electronics and Communication/ B.Sc., Electronics and Communication systems / B.Sc., Electronics /B.Sc., Physics /B.Sc., Industrial Electronics /B.Sc., Telecommunication** degree of this University or any of the above degree of any other university accepted by the syndicate as equivalent there to, subject to such condition as may be prescribed therefore shall be permitted to appear and qualify for the ***M.Sc., Electronics and Communication*** degree examination of this university after a course of study of two academic years.

2. DURATION OF THE COURSE

The course for the degree of **Master of Electronics and Communication** shall consist of two academic years divided into four semesters. Each semester consist of 90 working days.

3. COURSE OF STUDY

The course of study shall comprise instruction in the following subjects according to the syllabus and books prescribed from time to time.

4. EXAMINATIONS

The examination shall be three hours duration to each paper at the end of each semester. The candidate failing in any subject(s) will be permitted to appear for each failed subject(s)in the subsequent examination.

Extra Disciplinary Course (EDC) is introduced in the second semester. The Students should select any one **EDC paper offered by other Department**. Practical examinations for PG course should be conducted at the end of the ODD/ EVEN semester.

At the end of fourth semester viva-voce will be conducted on the basis of the dissertation / project report submitted by the student. The Viva – Voce will be conducted by one internal and one external examiner jointly.

COURSE OF STUDY AND SCHEME OF EXAMINATION

S.No.	Paper Code	Subject Title	Hours			University Examination		
			Lecture	Tutorial	Credits	Internal (25%)	External (75%)	Total
I SEMESTER								
1.	Core I	Applied Electronics	4	2	5	25	75	100
2.	Core II	ICs Fabrication and its Application	4	2	5	25	75	100
3.	Core III	Industrial Electronics	4	2	5	25	75	100
4.	Elective- I	(Any One Out of Two Electives)	2	4	4	25	75	100
5.	Core Practical- I	Applied Electronics and Digital Electronics Lab	1	2	2	40	60	100
6.	Core Practical -II	Industrial Electronics Lab	1	2	2	40	60	100
II SEMESTER								
7.	Core IV	Advanced Microprocessors and Interfacing	4	2	5	25	75	100
8.	Core V	Analog and Digital Communication System	4	2	5	25	75	100
9.	Elective -II	(Any One Out of Two Electives)	2	4	4	25	75	100
10.	Core Practical -III	Advanced Microprocessor and Simulation Lab	1	2	2	40	60	100
11.	Core Practical -IV	Analog and Digital Communication Lab	1	2	2	40	60	100
12.	EDC (or) Online Course	(Offered by Other Department) (or) SWAYAM / e-PG Pathshala / Course of any other MOOC portal)	4	0	2	25	75	100
13.	Common Paper	Human Rights	2	0	-	25	75	100
14.	Training	Summer Internship (15 - days)	2	0	2	40	60	100

S.No.	Paper Code	Subject Title	Hours			University Examination		
			Lecture	Tutorial	Credits	Internal (25%)	External (75%)	Total
III SEMESTER								
15.	Core VI	VLSI Design and VHDL Programming	4	2	5	25	75	100
16.	Core VII	Industrial Automation	4	2	5	25	75	100
17.	Core VIII	Microcontroller 8051	4	2	5	25	75	100
18.	Elective - III	(Any One Out of Two Electives)	2	4	4	25	75	100
19.	Core Practical- V	Core Practical 5: Industrial Automation Lab.	1	2	2	40	60	100
20.	Core Practical- VI	Core Practical 6: Microcontroller and VHDL Lab	1	2	2	40	60	100
IV SEMESTER								
21.	Core IX	Embedded Systems	4	2	5	25	75	100
22.	Core X	Computer Networks and Operating Systems	4	2	5	25	75	100
23.	Elective - IV	(Any One Out Of Two Electives)	2	4	4	25	75	100
24.	Core Practical -VII	Core Practical VII :Embedded System Lab	1	2	2	40	60	100
25	Project	Project Viva-Voce	2	7	6	-	100	100
	TOTAL:				**90**			**2500**

SUBJECT CREDITS : 90

TOTAL MARKS : 2400+100 (Internship) = 2500.

ELECTIVE:I

1. NETWORK AND JAVA PROGRAMMING
2. MOBILE COMMUNICATION

ELECTIVE:II

1. BIO MEDICAL INSTRUMENTATION
2. ROBOTICS AND AUTOMATION

ELECTIVE:III

1. INTERNET OF THINGS
2. ANDROID DEVELOPMENT TOOLS AND APPLICATIONS

ELECTIVE:IV

1. AUTOMOTIVE ELECTRONICS
2. THIN FILM AND NANO TECHNOLOGY

Question Paper Pattern for Theory Examination

Time: Three Hours **Maximum Marks:** 75

Part - A (15 X 1 = 15 Marks)

Answer **ALL** Questions Multiple Choice

Part - B (2 X 5 = 10 Marks)

Answer **ANY TWO** Questions out of **Five**

Part - C (5 X 10 = 50 Marks)

Answer **ALL** Questions

Either (or) Type Five Questions

(One question from Each Unit)

Internal

Max Marks: 25

Test	:	10
Assignment	:	5
Seminar	:	5
Attendance	:	5
Total	**:**	**25**

For Practical's

Max Marks: 60

One Question (Either or type)

1. DISSERTATION (100 Marks)

a. Topic

The topic of the dissertation shall be assigned to the candidate before the end of first semester and a copy of the same should be submitted to the University for Approval.

b. Advisory committee

Each guide shall have a maximum of five students in science and maximum of seven for all Arts subjects. There will be an advisory committee consisting of the guide as chairman and one member from the same department or allied departments of the college and a third member should be from other college preferably from Aided/Government colleges in the case of self financing college and vice–versa.

c. Plan of work

The student should prepare a plan of work for the dissertation, get the approval of the advisory committee and should be submitted to the university during the second semester of their study. In case the student wants to avail the facility from other University/Laboratory, they will undertake the work with the permission of the guide and acknowledge the alien facilities utilized by them. The duration of the dissertation research shall be a minimum of three months in the fourth semester.

d. Dissertation workout side the college of study

In case the student stays away for work from the college for more than one month, specific approval of the University should be obtained.

e. No. of Copies/ Distribution of Dissertation

The students should prepare three copies of dissertation and submit the same for the evaluation by examiners. After evaluation one copy is to be retained in the college library and one copy is to be submitted to the University (Registrar) and one copy can be held by the student.

f. Format to be followed

The formats / certificate for dissertation to be submitted by the students are given below:

Format for the preparation of project work:

i. Title page
ii. Bonafide certificate
iii. Acknowledgement
iv. Table of content

CONTENTS

1. Format of the title page

TITLE OF THE DISSERTATION

Dissertation submitted in partial fulfillment of the requirements for the degree of

Master of Science / Master of Arts in

to the

Periyar University, Salem - 11

By

NAME OF THE STUDENT

REG. NO.

College emblem

COLLEGE NAME

(AFFILIATED TO PERIYAR UNIVERSITY)

PLACE with Pin Code

MONTH – YEAR

2. Format of the Certificate

Name and Address of the Internal Guide

Place

Date

CERTIFICATE

This to certify that the dissertation entitled… .....Submitted in partial fulfillment of the requirement degree of Master Of Science / Master Of Arts in…… to Periyar University, Salem is a record of bonofide research work carried out by…under my supervision and guidance and that no part of the Dissertation has

been submitted for the award of any degree, diploma ,fellow ship or other similar titles or prizes and that the work has not been published in part of full in any scientific or popular journals or magazines.

Date :
Place :
Chairman, Advisory Committee

Approved by
Chairman:
Members:

1.
2.

External Examiner

Guidelines for approval of PG guides for guiding students in their research for submitting dissertation. 1. M.Sc. / M.A. (Part fulfillment) Guide :

The person seeking for recognition as guide should have.

a) M.Phil /M.A/M.Sc degree with first class/second class
b) Should have 3 years of active teaching/research experience.

1. They should have published at least one research paper in a National journal authored solely or jointly. Procedure for submitting application for approval as guides

a) The University will on request give prescribed application form.
b) The filled in applications should be submitted before the close of said date by the University.
c) All such applications should be routed through the Principal of the irrespective institutions with specific recommendations.
d) All relevant proofs should be submitted along with the applications.

2. Approval

The committee constituted for the purpose will scrutinize the applications and recommend for approval/rejection. Orders will then be passed by the authority of the university and communicated to each member individually through the Principal.

1. PASSING MINIMUM

The candidate shall be declared to have passed the examination if the candidate secures not less than 50 marks out of 100 marks in the University examination in each paper.

For the practical paper, a minimum of 50 marks out of 100 marks in the University examination and the record notebook taken together. There is no passing minimum for the record notebook. However submission of a record note book is a must.

For the project work and viva voce a candidate should secure 50% of the marks for pass.The candidate should compulsory attend viva voce examination to secure pass in that paper.

Candidate who does not obtain the required minimum marks for a pass in a paper/ project report shall be required to appear and pass the same at a subsequent appearance.

2. CLASSIFICATION OF SUCCESSFUL CANDIDATES

Candidates who secure not less than 60% of the aggregate marks in the whole examination shall be declared to have passed the examination in First Class.

All other successful candidates shall be declared to have passed in Second Class.

Candidates who obtain 75% of the marks in the aggregate shall be deemed to have passed the examination in First Class with Distinction provided they pass all the examinations prescribed for the course at the first appearance.

Candidates who pass all the examinations prescribed for the course in first instance and within a period of two academic years from the year of admission to the course only are eligible for University Ranking.

3. MAXIMUM DURATION FOR THE COMPLETION OF THE PG PROGRAMME

The maximum duration for completion of the PG programme shall not exceed eight semesters.

4. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2020-21, i.e., for students who are to be admitted to the first year of the course during the academic year 2020-21 and thereafter.

5. TRANSITORY PROVISION

Candidates who were admitted to the PG course of study before 2017-2018 shall be permitted to appear for the examinations under those regulations for a period of three years i.e., up to and inclusive of the examination of April/May 2015.

Thereafter, there will be permitted to appear for the examination only under the regulations then in force.

6. REGULATIONS OF PROJECT WORK

a. Students should do their three months project work in company/institutions.

b. The candidate to the department should submit the format which includes the topic of the dissertation, and the same should be submitted to the University for Approval.

c. Each internal guide shall have maximum **of FIVE students**.

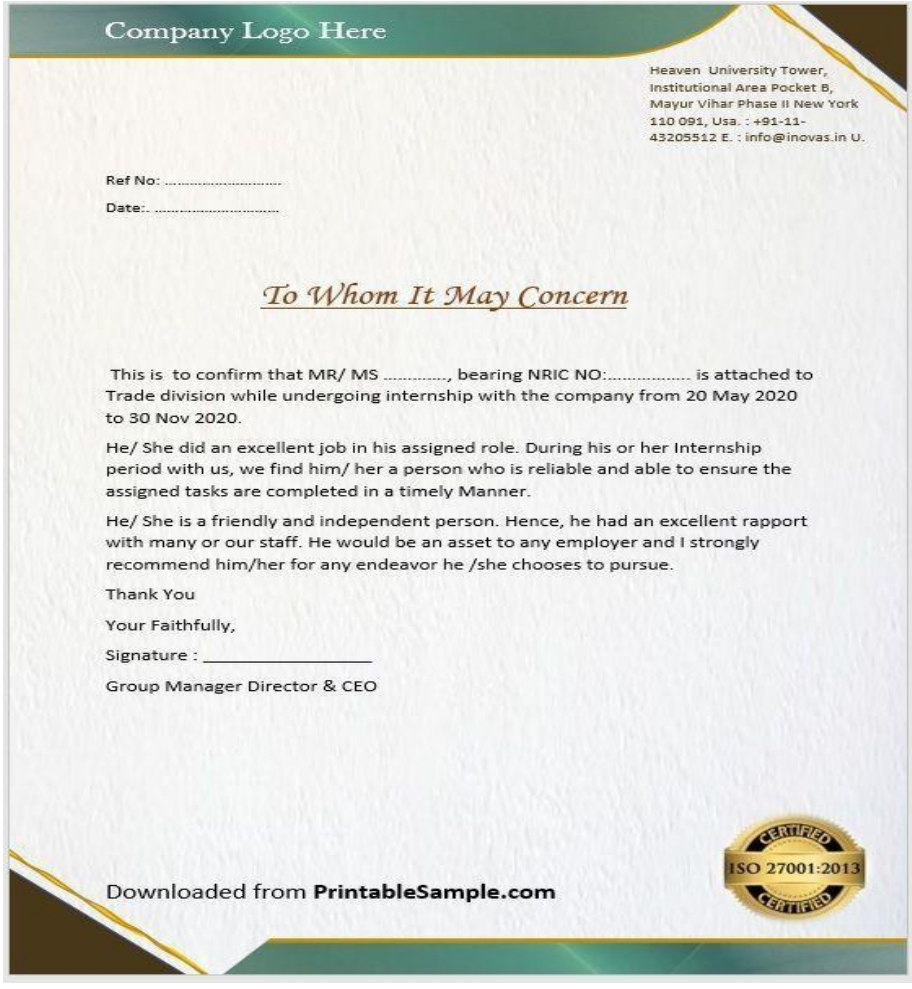
d. Periodically the project should be reviewed minimum three times by the advisory committee consisting of the guide and one member from the same department and the third member (Minimum 5 years experience) should be from other institutions / organization.

e. The students should use OHP/Power Point Presentation during their project Viva Voce examinations.

Internship Training :

Students have to undergo the internship training for 15 days in a company during the first semester vocation period . The Internal40 mark is awarded by the concern Guide (internal examiner) and the External 60 mark is awarded by the relevant organization (Technical Manager /Research Manager of the company) .

Certificate (Sample):



SEMESTER - I

1. CORE I: APPLIED ELECTRONICS

OBJECTIVES

- To update the knowledge about analog circuits and its characteristics.
- To develop the basic concepts of analog circuit design.
- To impart the knowledge in the oscillators and its design.

Expected Course Outcomes (CO):

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

CO1	Understand and analyze about the various diode characteristics and applications.	K2,K4
CO2	Comprehend the characteristics of various types of rectifiers and analyze the regulations with its applications.	K2,K4
CO3	Design the transistors and implementing the biasing concepts and study the amplifications with its application	K3,K4
CO4	Analyze the transistor characteristics, types of amplifiers and the various types of feedback circuits.	K1,K4,K5
CO5	Develop an ability to differentiate the oscillators and its applications .	K2,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	L
CO2	S	M	S	L	S
CO3	M	M	S	S	M
CO4	L	S	M	L	S
CO5	S	S	L	S	S

*S-Strong; M-Medium; L-Low

Unit –I Diodes

Introduction To Semiconductor – N Type and P Type –PN Junction Diode – ZENER Diode – Tunnel Diode– Photodiodes – LED – Gunn Diode – Step recovery diode -Varactor diode – Laser diode – BARITT Diode And Its Application

Unit-II Rectifiers

Half Wave Rectifier - Full Wave Rectifier – Bridge rectifier - % of regulation – RMS value – peak value – Average value – application.

Unit-III Bipolar Junction Transistors

Bipolar Junction Transistors Construction and Operation – Transistor Biasing - Configurations and Characteristics-Current Gains-H-Parameters and Analysis of Transistor Amplifier Using H-Parameter-Inter Conversions in Different Configuration-Thermal Instability and

Bias Stabilization-Cascaded Transistors.

UNIT – IV Amplifiers

Classification of Amplifiers – Single Stage Amplifiers (CE, CB, & CC) -Class A, Class B, Class C, Push Pull, Complementary Symmetry Push Pull Amplifier – Multistage Amplifier Transformer Coupled Class- A Power Amplifier-Efficiency and Crossover Distortion-Class- B Push Pull Amplifier-Single Tuned and Double Tuned Amplifier-Classification of Feedback Amplifiers-Effect of Negative Feedback-Stability and Response of Feedback Amplifiers

UNIT – V Oscillators

Classification Of Oscillators Wien Bridge Oscillator-RC Phase Shift Oscillator-Hartley Oscillator-Voltage Controlled Oscillator-Colpitts Oscillator-Clapp Oscillators-Crystal Oscillators-Armstrong Oscillator-Tuned Collector Oscillator-Gunn Oscillator-Cross-Coupled Oscillators-Ring Oscillators-Multi-Wave Oscillators

TEXT BOOKS

1. Applied Electronics –R.S.SEDHA
2. Electronic Device and Circuits-"TATA MCGRAW HILLS" BY S.SALIVAHANAN N.SURESH **REFERENCE BOOKS**

1. "Electronic devices Application and Integrated CIRUITS "UMESH PUBLICATION" by ATHUR, KULSHRESHTHA, CHADHA.KUMAR
2. V.K.Puri – Digital Electronics Circuits and System – Tata McGraw Hill Publishing Company Limited, New Delhi. ISBN 0-07-463317.
3. Donald P.Leach and Albert Paul Malvino – Digital Principles and Applications - Tata McGraw Hill Publishing Company Ltd, New Delhi. ISBN 0-02-801821-4.

SEMESTER-I

2. CORE-II: IC'S FABRICATION AND ITS APPLICATIONS

OBJECTIVES

- To design the integrated circuits based on our applications.
- To develop the knowledge in the basic digital filters circuit design.
- To understand the concepts of multivibrators and design.

Expected Course Outcomes (CO):

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

CO1	Understand the fundamentals of IC‟S and the active and passive components. Analyzing the FET fabrication . study the thin and thick film technology.	K1,K2
CO2	Understand the OP AMP circuits and its various applications.	K2,K3,K4
CO3	Study the output waves based on design and how to regulate the voltages using op amp.	K3,K6
CO4	Understand the filters and to find the concepts of ADC/ DAC converters.	K1,K2
CO5	Describe the functions of Multivibrators , PLL and understand the various applications of 555 IC.	K4,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Mapping with Programme Outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	L	S	L	S	L
CO2	S	M	M	S	S
CO3	S	M	S	S	M
CO4	L	S	M	L	M
CO5	M	S	L	M	S

*S-Strong; M-Medium; L-Low

UNIT I

Introduction-Classification-IC Chip Size and Circuit Complexity-Fundamentals of Monolithic IC Technology-Basic Planar Processes-Fabrication of a Typical Circuit- Active and Passive Components of IC's - Fabrication of FET - Thin and Thick Film Technology Trends.

UNIT II

Introduction-Basic Information of Operational Amplifiers -the Ideal Operational Amplifiers-DC Characteristics-AC Characteristics-Analysis of Data Sheets of Op- amp. Basic Application of Operational Amplifiers - Differentiator-Integrator – Instrumentation Amplifier-Log and Antilog Amplifiers.

UNIT III

Comparators – Applications – Zero Crossing Detectors - Schmitt Trigger - Square Wave Generator - Triangular Wave Generators - Sine Wave Generators. Voltage Regulator-Fixed Output and Adjustable Voltage Regulators-Switching Regulators.

UNIT IV

Active Filters-First Order and Second Order Low Pass Filter-High Pass Filter-Band Pass Filter-Band Rejection Filters. Voltage to Frequency and Frequency Converters–Analog to Digital and Digital to Analog Converters

UNIT V

Introduction to IC 555-IC 555 as a Monostable Multivibrator–Applications-IC555as Astable Multivibrator-Applications. Phase Locked Loop (PLL)-Operating Principles- Monolithic Phase Locked Loop-IC 555 Applications.

TEXT BOOKS:

1. D-Roy Choudhury and Shail B.Jaisn–Linear Integrated Circuits–2nd Edition–New Age International Publishers.ISBN-81-224-1470-2.
2. Ramakant A. Gayakwad – OpAmps and Linear Integrated Circuits – 4th Edition – Prentice Hall of India PrivateLtd, New Delhi.ISBN-81-203-2058-1.

REFERENCE BOOKS:

1. K.R.Botkar–IntegratedCircuits–4thEdition–KannaPublishers, NewDelhi.
2. Coughlin and Discoll – Operational Amplifiers and Linear Integrated Circuits –3rdedition–PHI1989.

SEMESTER-I

3. CORE- III: INDUSTRIAL ELECTRONICS

OBJECTIVES

- To learn the characteristics of different types of semiconductor devices and the operation of controlled rectifiers.
- To understand the operation of choppers and inverters.
- To learn the concept of electric drives and its functions

Expected Course Outcomes (CO):

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

CO1	Understanding the types and the operations of thyristors and its characteristics. Study the firing angle.Design the converter circuits and study	K1,K2
	the outputs .	
CO2	Understands the concepts of single phase and three phase controllers outputs.	K2,K3,K4
CO3	Analyze the thyristors commutation methods and comparisons with its application	K1,K4
CO4	Ability and understand the choppers and switches with its applications .	K5,K6
CO5	Determine the drivers and the various phase controllers . To know the current control and voltage control concepts .	K4,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	L
CO2	S	L	L	L	S
CO3	M	S	M	S	M
CO4	S	S	M	M	L
CO5	S	S	L	L	M

*S-Strong; M-Medium; L-Low

UNIT I

Thyristors and Converters

Thyristors – Construction, Operation Characteristics and Applications of SCR, LASCR, TRAIC, DIAC and UJT – THYRSITOR Rating – Rectifier Circuits using SCR. Two Transistors Model of Thyristors- Thyristors Firing Circuits Principle of Phase Controlled Converter Operation Single Phase Semi converters – Single Phase Converters Single Phase Dual Converters – Single Phase Series Converters. Three Phase Half Wave Converters.

UNIT II

AC Voltage Controller

Principle of ON-OFF Control–Principle of Phase Control–Single Phase Bidirectional Controllers with Resister Loads –Single Phase Controller With Inductor Loads–Three Phase Half Wave Controller –Three Phase Full Wave Controllers–Cycloconverters.

UNIT III

Thyristors Commutation Techniques

Natural Commutation – Forced Commutation – Self Commutation – Impulse Commutation – Resonant Pulse Commutation – Complimentary Commutation – External Pulse Commutation – Resonant Pulse Commutation – Complimentary Commutation – External Pulse Commutation – Load Side Commutation – Line Side Commutation

UNIT IV

DC Choppers and Static Switches

DC Choppers–Introduction–Principle of Step–Down Operation–Principle of Step up Operation – Switching Mode Regulators – Thyristors Chopper Circuits. Static Switches Mode Regulators–Single Phase AC Switcher–Three Phase AC Switching– Three Phase Reversing Switches .Solid State Relays.

UNIT–V DC Drives and AC Drivers

Basic Characteristic of DC Motor – Operating Modes – Single Phase Half Wave Conversion Driver – Single Phase Semiconductor Drivers – Single Phase Full Converter – Single Phase Dual Converter Drivers, Three Phase Half Wave Converter Drivers. Induction Motor Drivers – Performance Characteristics – Stator Voltage Control – Rotor Voltage Controller – Rotor Voltage Control – Frequency Control – Voltage and Frequency Controller – Current Control – Voltage, Current And Frequency Control – Closed Loop Control of Inductors Motors.

TEXT BOOKS

1. Muhammad H. Rashid – Power Electronics Circuits, Devices, and Applications-2nd edition–Prentice Hall of India Private Ltd, New Delhi. ISBN--81-203-06869-7.
2. MD.Singhand K.B.Khanchandani-Power Electronic-Tata McGraw Hill Publishing Company Ltd, New Delhi.ISBN-0-07-463369-4.

REFERENCE BOOKS

1. PCSen-Power Electronic–Tata McGraw Hill Publishing Company Ltd,New Delhi. ISBN-0-07-462400-8.

2.G.KDUBEY,SRDORADLA,AJOSHI&RMKSINHA-Thysiorised Power Controllers– New Age International Publishers.ISBN-085226190X.

SEMESTER-I: 4.ELECTIVE -I

SEMESTER-I5.CORE PRACTICAL- I: APPLIED ELECTRONICS AND DIGITAL ELECTRONICS LAB

OBJECTIVES

- To designing power supply systems and to study the outputs . .
- To create multiplexer and demultiplexer circuits and verifying of outputs.
- To develop circuit for counters ,flip-flops and registers.

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of power supply, oscillator, multivibrator , flip-flop and counters .	K2,K3
CO2	Identify The Different Ways operations and designing.	K1,K6
CO3	Developing the various digital circuits like counters ,flip-flops and registers . .	K4,K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	M	L	S
CO2	M	S	L	M	S
CO3	S	L	M	M	S

*S-Strong; M-Medium; L-Low

Any TEN Experiments

1. Construction of Dual Power Supply
2. Construction of ZENER Regulated Power Supply.
3. Characteristics of Transistor under CE Configuration.
4. Characteristics of UJT and Construction of UJT Relaxation Oscillator
5. Construction of Hartley Oscillator.
6. Construction of Phase Shift Oscillator
7. Construction of astable, monostable and bistable multivibrators using transistor.
8. Full adder and Full Subtractor
9. Study of multiplexer, De multiplexer.

10. Encoder and decoder.
11. Study of RS and D, JK, master slave and T flip flop.
12. Construction of shift registers
13. Construction of BCD and UP/Down counter.

SEMESTER-I

6.CORE PRACTICAL II: INDUSTRIAL ELECTRONICS LAB

OBJECTIVES

- To study the V-I characteristics of various power devices.
- To create the circuits of commutations and verifying its outputs.
- To develop circuit for motor speed control for various applications .

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of power supply,SCR, Commutation and LDR applications.	K2,K5
CO2	Identify The Different Ways operations and designing.	K3
CO3	Develop circuit construction skills and verifying of outputs .	K4,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	L	S
CO2	M	S	S	L	S
CO3	S	L	S	M	M

*S-Strong; M-Medium; L-Low

Any TEN Experiments

1. Firing Characteristics of SCR and TRIAC.
2. Half Wave Gate Controlled Rectifier using one SCR.
3. Illumination Control using TRIAC.
4. Single Phase Half Controlled Full Wave Rectifier Using Two SCR'S.
5. Singe phase half controlled rectifier using two Diodes.
6. Switching Regulators.
7. Forced Commutation.
8. Single Phase Inverter.
9. Zero Voltage Switches.
10. Speed Control of DC Motor using Thyristors.
11. LDR Application in a Light Activated Turn-OFF Circuit.

REFERENCE BOOK

1. Coughlin and Discoll – Operational Amplifiers and Linear Integrated Circuits –3rdedition– PHI1989.

SEMESTER - II

7. CORE-IV: ADVANCED MICROPROCESSORS AND INTERFACING

OBJECTIVES

- To learn the concepts of x86 processors.
- To understand the operation of RISC architecture.
- To learn the concept of paging and segmentation.

Expected Course Outcomes (CO):

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

CO1	Understand the 8085/8086 microprocessor and its operations. Know the concepts of memory management .	K1,K5
CO2	Design the simple programs of 8086. Learning the procedures of time delay , looping and addressing modes .	K3,K6
CO3	Design of 80386 architecture , addressing modes and to know the concepts of paging and segmentations.	K4,K5
CO4	Understand the functions of Pentium and intel processors .	K2,K5
CO5	Know the RISC processor and its architecture issues.	K1,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	M	L	S	L
CO3	M	S	H	S	M
CO4	L	L	M	M	S
CO5	S	L	L	S	M

*S-Strong; M-Medium; L-Low

UNIT I: 8085 MICROPRICESSOR

Introduction To 8085-Bus Structure - Register Set – Pin Details And Functions – Architecture Of 8085-Addressing Mode – Instruction Set –Timing Diagram

UNIT II

INTEL 8086 MICROPROCESSOR

Introduction to 8086 microprocessor - internal architecture – execution unit –General purpose registers – instruction pointers – addressing modes – instruction set– constructing the machine codes for 8086 instructions – segment registers – Memory segmentation.

UNIT III

8086 ASSEMBLY LANGUAGE PROGRAMMING

Simple programs – finding average of two numbers – conditional and unconditional jump instructions – conditional flags – time ,delay loops – timing diagram – minimum mode – addressing memory and I/O ports – addressing and address decoding – maximum mode.

UNIT IV

ADVANCED MICROPROCESSORS

Salient features of 80386 – Architecture and signal descriptors of 80386- Register organization of 80386- Addressing Modes - Segmentation- paging. Salient features of Pentium – System Architecture – Intel MMX Architecture – Salient features of Pentium 4 .

UNIT V

RISC ARCHITECTURE

History of RISC Processors- RISC and CISC Convergence – Advantages of RISC – Features of RISC – Design issues – Performance issues in RISC Pipeline- RISC Architecture.

TEXT BOOKS

1. Douglas V. Hall, “Microprocessors and Interfacing Programming and Hardware”, Second Edition, Tata McGraw- Hill.

2. Bhurchandi K.M, Roy A.K. “Advanced Microprocessors & Peripherals”, Third Edition , Tata McGraw-Hill, New Delhi

REFERENCE BOOKS

1. K.R. Venugopal Rajkumar, “Microprocessor X86 Programming”, New Delhi, BPB Publications, 2005.

2. M. Rafiquzzaman, “Microprocessors, Theory and Applications”, Intel and Motorola (Revised edition), Prentice Hall India.

SEMESTER - II

8. CORE V: ANALOG AND DIGITAL COMMUNICATION SYSTEM

OBJECTIVES

- To learn the concepts about analog and digital modulation and detection .
- To understand the operation TV scanning procedures .
- To implementing the concepts of HV deflections.
- **Expected Course Outcomes (CO):**

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

CO1	Remembering the various waves and antennas for transmission.	K1,K2
CO2	Remembering of various analog modulations and its applications.	K1,K3
CO3	To know the concepts of pulse modulations and its types .	K4,K6
CO4	Understand the concepts digital modulations and comparisons".	K2,K5
CO5	Analyzing of TV circuits and evaluating the signals in various stages. .	K4,K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	L
CO2	L	S	S	M	S
CO3	M	M	S	S	S
CO4	S	L	M	L	M
CO5	S	S	L	S	M

*S-Strong; M-Medium; L-Low

UNIT I

Radio Wave Propagation Antennas**:** Electronic Radiation – Fundamentals – Effects - Propagation of Waves - Ground Waves - Sky Waves Propagation - Space.

Antenna - Basic Consideration - Wire Radiators In Space - Term and Definitions – Effects of Ground on Antennas-Directional High Frequency Consenters-Microwave Antennas-Wide Band Antennas-Folded Dipole-Helical Antenna.

UNIT II

Amplitude Modulation Theory-Frequency Spectrum of the AM Wave-Representation of AM – Power Relations in the AM Wave - Generation of AM - Basic Requirements - Grid Modulated Class C Amplifiers - Modulated Transistor Amplifier - System Summary.

Frequency Modulation - Theory of Frequency and Phase Modulation - Noise and Frequency Modulation - Generation of Frequency Modulation .

UNIT III

Introduction - Pulse Amplitude Modulation (PAM) - Sampling Theorem Quantization & Quantization Error -Pulse Code Modulation (PCM) modulation and detection - Pulse Frequency Modulation (PFM) - Pulse TIME Modulation (PTM) - Pulse Position Modulation (PPM) - Pulse With Modulation (PWM).

UNIT IV

Companding –modulation and detection of ASK, FSK, BPSK, QPSK and DPSK – comparison of ASK,FSK and PSK.

UNIT V

Requirements and Standards - Introduction to Television -Television System and Standards-Black and White Transmission–Scanning-Blanking and Synchronizing Pulse - Black and White Reception – Fundamentals - Common Video and Sound Circuits-Vertical Deflection Circuits-Horizontal Circuits-Color Transmission and Reception.

TEXT BOOKS

1.Dennis Reddy and John Coolen–Electronic Communications–4thEdition–Prentice HallofIndiaPrivateLtd,NewDelhi.ISBN-81-203-0984-7.

2.George Kennedy–Electronic Communication System–3rdEdition-TatMcGrawHill Publishing Company Ltd,New Delhi.ISBN0-07-034054-4.

REFERENCE BOOKS

1. Electronic Communications – Sanjeev Gupta – Khanna Publications.
2. Principles Of Communication Engineering – Anokh Singh – S.Chand.
3. Herbert Taub and Donald L. Schilling – Principles of Communication Systems –2nd Edition-McGrawHillPublishingCompanyLtd,NewDelhi.ISBN0-07-062955-2.
4. Robert J. Schonbeck – Electronic Communication Modulation and Transmission - 2ndEdition-PrenticeHallofIndia.ISBN-81-203-1483-2.
5. B.P.Lathi–ModernDigitalandAnalogCommunicationSystem–3rdEdition,-Oxford UniversityPress.ISBN0-19-51009-9.
6. K. Sam Shanmugam – Digital and Analog Communication System – John Wiley & Sons. ISBN9971-51-146-0

SEMESTER-II: 9.ELECTIVE-II

SEMESTER-II

10.CORE PRACTICAL III: ADVANCED MICROPROCESSOR AND SIMULATION LAB

OBJECTIVES

- To write the assembly language for various operations and various conversions .
- To create the coding of various applications and interfacings.
- To develop the skills for various applications.

To develop circuit for motor speed control for various applications

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of arithmetical oprations , ADC,DAC and ON/OFF relay control.	K1,K4,K5
CO2	Identify The Different Ways operations and interface designing.	K1,K3,K4
CO3	Develop the assembly language programming skills and verifying of outputs .	K3,K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	L	S	S	S
CO2	S	M	L	S	S
CO3	S	L	S	M	M

*S-Strong; M-Medium; L-Low

Any TEN Experiments(Using Simulation or 8085 or 8086 Kit)

1. 8-Bit Addition, Subtraction, Multiplication, and Division and using 8085/8086 µp Kit.
2. 16-Bit Addition, Subtraction, Multiplication, and Division and using 8085/8086 µp Kit.
3. Digital Clock using 8085/8086 µp Kit.
4. Stepper Motor Interface using8085/8086 µp Kit.
5. DC Motor Speed Control using 8085 /8085µp Kit.
6. Traffic Light Controller Interface using 8085/8086 µp Kit.
7. Interfacing ADC 0809 with using 8085/8086 µp Kit.
8. DAC Interface with8085/ 8086 µp Kit and Wave Form Generations using DAC.
9. ON and OFF Relay Control using 8085/8086 interrupts.
10. Addition of two 16-Bit Numbers and Double Precision Addition using 8085/8086 µp Kit.
11. Subtraction of two 16-Bit Numbers and Double Precision Subtraction using8085/ 8086 µp Kit.
12. 16-Bit Multiplication and 32-Bit Division using Addition of two 16-bit Numbers and Double Precision Addition using 8085/8086 µp Kit.
13. Temperature Measurements Using 8085/ 8086.

SEMESTER - II

11.CORE PRACTICAL IV: ANALOG AND DIGITAL COMMUNICATION LAB

OBJECTIVES

- To study the various modulation techniques and verifying its outputs.
- To create the circuits of commutations applications .
- To develop the circuit skills of communications devices.

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of analog modulation , pulse modulation and CCTV concepts .	K2,K3,K4
CO2	Identify The Different Ways operations and designing.	K1.K4,K6
CO3	Develop the circuit skills and verifying of outputs .	K4,K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	M	S
CO2	M	S	M	L	S
CO3	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Any TEN Experiments

1. AM Modulation and Demodulation.
2. FM Modulation and Demodulation
3. Automatic Gain Control.
4. Voltage Control Oscillator.
5. Pulse Amplitude Modulation.
6. Pulse Width Modulation.
7. Pulse Position Modulation.
8. Study of Pulse Code Modulation.
9. Study of PLL Characteristics.
10. Digital Phase Detector.
11. Installation of CCTV.
12. DVR of CCTV.
13. Study of Cable TV System.

12. EDC (OFFERED BY OTHER DEPARTMENT)

13. COMMON PAPER: HUMAN RIGHTS

14. ONLINE COURSE: SWAYAM/MOOC (any one course)

SEMESTER-III

15. CORE-VI: VLSI DESIGN AND VHDL PROGRAMMING

OBJECTIVES

- To learn the basics of VLSI technology and VHDL programming.
- To promoting the knowledge in modeling techniques and features .
- **Expected Course Outcomes (CO):**

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

CO1	Understands the MOS devices and fabrications process. How the n-MOS AND p-MOS processed .	K1.K2
CO2	Know the basics of VHDL.	K2`K3
CO3	Understand the modeling techniques of VHDL Design the multiple process concepts .	K2,K4
CO4	Ability and to understand the data flow style modeling for various statements .	K1,K5
CO5	Applying the advanced concepts in VHDL. Applying the overloading techniques.	K3,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	L
CO2	S	M	M	M	S
CO3	S	S	S	S	L
CO4	M	S	M	L	M
CO5	S	L	L	S	S

*S-Strong; M-Medium; L-Low

UNIT -I: CMOS Circuits & Processing Technology

MOS Transistor – Switches – CMOS Logics – Inverter – Combinational Logic – NAND Gate – NOR Gate Compound Gates – Multiplexer – SI Semiconductor Technology Overview – Wafer Processing – Oxidation – Epitaxial Deposition – Ion Implantation – Diffusion – SI Gate Insulator Process – CMOS Technology - n-well Process – p well Process – Twin-Tub Process – Silicon on Insulator – CMOS Process Enhancements

UNIT -II: Introduction and Basic Concept of VHDL

History of VHDL – Capabilities of VHDL – Hardware Abstraction – Basic Terminology – Entity Declaration - Architecture Body Declaration – Basic Language Elements – Identifiers – Data Objects – Data Operators.

UNIT -III: Modeling Techniques of VHDL

Behavioral Modeling: Entity Declaration – Architecture Declaration – Process Statements- Variable Assignment Statements – Signal Assignments Statements – Wait Statement – If Statement – Case Statement – Null Statement – Loop Statement – Exit Statement – Next Statement – Assertion Statement – Report Statements – More on Signal Assignment Statement – Multiple Process – Postponed Process.

UNIT -IV: Data Flow Style of Modeling

Concurrent Signal Assignment Statement Versus Signal Assignment – Delta Delay Revisited – Multiple Drivers – Conditional Signal Assignment Statement – Selected Signal Assignment Statement – Unaffected Value – Block Statement- Concurrent Assertion Statement – Value of the Signal.

UNIT- V: Advanced Features in VHDL

Generics – Configuration – Configuration Specification – Configuration Declaration – Default Rules – Conversion Functions – Direct Instantiation – Incremental Binding - Sub Programs – Sub Program Overloading - Operator Overloading - Signatures – Default Value of Parameters.

TEXT BOOKS

1. Neil H.E. Westw Kamaran Eshraghin, „"Principles of CMOS VLSI Design""
2. J.Bhasker, "VHDL Primer"", Low Price Edition, 2001 PHI 3.Charles H. Roth, and Jr."Digital System.

REFERENCE BOOKS

1. Design Using VHDL", Brooks/Cole Thomson Learning PWS Publishing, ISBN-981-240-052-4
2. Neil H.E.Weste, TLW "Principles of CMOS VLSI Design" Addison Welsley New Delhi.

SEMESTER-III

16. CORE-VII: INDUSTRIAL AUTOMATION

OBJECTIVES

- To provide knowledge about data acquisition and control an external measuring device by interfacing to a computer.
- To familiarize in signal conditioning and various processing tools.
- To become competent in designing virtual instruments for various industrial measurements and applications.

Expected Course Outcomes (CO):

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

CO1	Understand the basics of LABVIEW and its tools.	K1,K2
CO2	Know the arrays and clusters concepts .	K3,K4
CO3	Understand the Data acquisition procedure and hardware configuration . Design the software solutions for DAQ.	K2,K5
CO4	Creating the PLC programming and intermediate functions**.**	K3,K6
CO5	Develop the ability for Data handling and PLC functions .	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	L	S
CO2	S	L	S	L	S
CO3	M	M	L	L	M
CO4	L	S	M	S	S
CO5	S	S	M	L	L

*S-Strong; M-Medium; L-Low

UNIT I: INTRODUCTION TO LABVIEW AND LOOPS

Introduction- Advantages of Lab VIEW- Software Environment – Front Panel Control and Indicators- Block diagram- Data Types- Data Flow Program- LOOPS: For Loop- While Loop-

Structure Tunnels- Shift registers- Feedback Nodes- Control Timing- Communication among multiple loops- Local variables- Global variables.

UNIT II: ARRAYS AND CLUSTERS

Introduction- Arrays in Lab VIEW- One Dimensional array- Two Dimensional array- Multi dimensional array- Initializing arrays- Deletion, Inserting and Replacing – Array functions- Matrix operations with array. Clusters: Introduction- creating controls, Indicators and constant,- Cluster operations- Assembling and Disassembling clusters- conversion between arrays and clusters. Waveforms - waveform chart- XY graphics.

UNIT III: DATA ACQUISITION

Introduction- signals- signal conditioning- DAQ hardware configuration- DAQ hardware- Analog Inputs- Analog outputs- Counters- DAQ software architecture- DAQ assistant- Selecting and configuring a data acquisition device- Components of computer based measurements system.

UNIT IV :BASIC PLC PROGRAMMING & FUNCTION AND INTERMEDIATE FUNCTION

General PLC programming procedures - Programming on/off inputs and outputs: Relation of digital gate logic to contact/ coil logic - Creating ladder diagrams from process control descriptions - Logic gates. PLC Register Basics.

Programming Timers - On Delay Timer Instruction - Off Delay Timer Instruction. Programming Counters - Up Counter - Down Counter. Math Instruction - Addition - Subtraction - Multiplication - Division. Number comparison functions - Numbering systems and PLC number conversion functions.

UNIT V

DATA HANDLING FUNCTIONS AND PLC FUNCTIONS WORKING WITH BITS

The PLC SKIP and MASTER CONTROL RELAY functions - JUMP Functions - Data Move Systems - Other PLC Data Handling Functions - Digital Bit Functions and Applications - Sequencer functions - Controlling Robot with a PLC - Matrix functions.

TEXT BOOKS

1. Jovitha Jerome, "Virtual Instrumentation Using LabVIEW", Eastern Economy Edition, PHI Learning private ltd, 2010.
2. John W. Webb &Ronald A., Reis, "Programmable Logic Controllers Principles and Applications", Fifth Edition, Prentice Hall Publication, New Delhi, 2002.

REFERENCE BOOKS

1. Frank D. Petruzella, "Programmable Logic Controllers", Third Edition, Tata McGraw Hill Education Private Limited, 2010.
2. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications,USA,2004.
3. David Bailey, Edwin Wright, Practical SCADA for industry, Newnes, 2003
4. S.Gupta and J.P.Gupta, "PC Interfacing for Data Acquisition and Process Control" Instrument society of America, 1994.

5. Peter W. Gofton, “Understanding Serial Communications” Sybex International.
6. Robert H.Bishop, “Learning with Lab VIEW” Prentice Hall, 2003.

SEMESTER-III

17. CORE VIII – MICROCONTROLLER 8051

OBJECTIVES

- Familiarize the basic architecture of 8051 microcontroller.
- Program 8051microprocessor using Assembly Level Language and C.
- Interface 8051 to external memory and I/O devices using its I/O ports.

Expected Course Outcomes (CO):

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

CO1	Remember the 8051 architecture and memory concepts .	K1,K3
CO2	Understands the various instructions of 8051.	K2,K3
CO3	Design of the stack and analyzing the interfacing concepts .	K4,K5
CO4	Classify the assembly language programming and the port operations. Understand that how to apply C language in the controllers .	K4,K6
CO5	Create the interfacing concepts for stepper motor and traffic light controllers . analyzing the ADC and DAC conversions .	K4,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	M
CO2	S	M	S	M	S
CO3	S	M	S	L	M
CO4	S	S	M	S	S
CO5	M	M	S	M	S

*S-Strong; M-Medium; L-Low

UNIT -I

8051 Microcontroller: Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization. External Memory (ROM & RAM) interfacing.

UNIT -II

8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (with & without loops) to use these instructions.

UNIT-III

8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops - Delay subroutine, Factorial of an

8 bit number (result maximum 8 bit), Block move without overlap, Addition of N 8 bit numbers, Picking smallest/largest of N 8 bit numbers. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status.

UNIT -IV

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially.

UNIT-V

8051 Interfacing: LCD interfacing, Keyboard interfacing. ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfaces to 8051, DAC interfacing, Sensor interfacing and signal conditioning. stepper motor interfacing, DC motor interfacing and PWM.

TEXT BOOKS

1. "The 8051 Microcontroller and Embedded Systems – using assembly and C ", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.

2. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

REFERENCE BOOKS

1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

2. "Microcontrollers: Architecture, Programming, Interfacing and System Design", Raj Kamal, Pearson Education, 2005.

SEMESTER-III: 18.ELECTIVE-III

SEMESTER-III

19. CORE PRACTICAL-V: INDUSTRIAL AUTOMATION LAB

OBJECTIVES

- To designing virtual instruments for various industrial measurements for various applications .
- To create ladder diagrams from PLC functions and Data Handling Functions
- To create PLC systems in their applications to various industries.

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of ADC, DAC using DAQ . Understand LVDT, instrumentation amplifier , flow measuremenrs and ladder networks .	K1,K4,K6
CO2	Identify the Different Ways operations and designing.	K2,K4,K5
CO3	Develop the circuit skills and verifying of outputs .	K2,K5,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	L	S
CO2	M	M	S	L	S
CO3	S	L	S	M	S

*S-Strong; M-Medium; L-Low

Any TEN Experiments:

(USING Lab VIEW)

1. Converting VI in to Sub VI
2. ADC using DAQ Interface
3. DAC using DAQ Interface
4. Temperature control using WSN
5. Implementation of Digital filters using Lab VIEW DSP Module
6. ADC and LCD interface using Lab VIEW ARM Module
7. Tank level monitoring system using DAQ Interface
8. Traffic light control using DAQ Interface

(USING PLC)

9. Study the operation of a simple load using relays , switches and push buttons.
10. Study of Instrumentation amplifier
11. Study of P.I.D Controller.
12. Study of Flow measurement
13. Study of Thermocouple characteristics
14. Study of traffic light controller.
15. Develop the Ladder diagram for the Arithmetic and Logic Gates.
16. Develop and test the control circuit for dynamic braking of DC motor using ladder programming (Timer and UP/Down Counter).
17. Develop and test the control circuit for Conveyor using ladder programming.

SEMESTER - III

20. CORE PRACTICAL VI: MICROCONTROLLER AND VHDL LAB

OBJECTIVES

- To writing assembly language programs for data transfer, arithmetic, Boolean and logical instructions.
- To writing assembly language programs for code conversions

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of arithmetical , Boolean ,generation of wave forms using microcontroller. Understand the concepts of gates, adders , subtractors, multiplexers ,LCDs and coders using VHDL language. concepts .	K1,K3,K6
CO2	Identify the Different Ways operations and designing.	K2,K3,K5
CO3	Develop the programming skills and verifying of outputs .	K3,K4,K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	S	L	S
CO2	M	M	S	M	S
CO3	S	L	M	S	S

*S-Strong; M-Medium; L-Low

Any Ten Experiments (MICROCONTROLLER)

1. Data transfer – Program for block data movement, sorting, exchanging, finding largest element in an array.
2. Arithmetic instructions: Addition, subtraction, multiplication and division. Square and cube operations for 16 bit numbers.
3. Counters.
4. Boolean and logical instructions (bit manipulation).
5. Conditional call and return instructions.
6. Code conversion programs – BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hex to decimal and Decimal to Hex.
7. Programs to generate delay, Programs using serial port and on-chip timer/counters.
8. Stepper motor interface.
9. DC motor interface for direction and speed control using PWM.
10. Alphanumerical LCD panel interface.
11. Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.
12. External ADC and Temperature control interface.

(VHDL Lab)

13. Write a program to Verify the Logic Gates
14. Write a program for Half Adder and Full Adder
15. Write a program for Half Subtractor and Full Subtractor
16. Write a program for Encoder
17. Write a program for Decoder
18. Write a program for Multiplexer
19. Write a program for De multiplexer.

SEMESTER-IV

21. CORE-IX: EMBEDDED SYSTEMS

OBJECTIVES:

- To understand the basics of embedded C.
- To study the architecture of PIC microcontroller.
- To familiarize in PIC programming.

Expected Course Outcomes (CO):

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

CO1	Understanding of C programming concepts and its applications .	K1,K2
CO2	Justifying the conditional and looping statements in C.	K2,K4
CO3	Designing the embedded system and its concepts with its application	K4,K5
CO4	Ability and to understand PIC PROGRAMMING: PIC 16F877 and its instruction set uses.	K3,K5
CO5	Develops an analyze the interfacing techniques with applications .	K3,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	S	S	L
CO2	S	M	S	L	S
CO3	M	S	M	S	M
CO4	S	M	S	M	S
CO5	S	M	L	S	S

*S-Strong; M-Medium; L-Low

UNIT I

INTRODUCTION TO C PROGRAMMING: Structure of C programming - Various data types, C Tokens, Keywords and Identifier, Constants, Variables, Data types, Variable declarations. C-Operators: Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, special operators, arithmetic expressions, evaluation of expressions, precedence of arithmetic operators.

UNIT II

DECISION MAKING, BRANCHING AND LOOPING: Decision making - IF statement, Switch statement, Conditional operator. Go to statement. Looping: While loop, Do-While, and For Loops - Nesting of loops - skipping of loops (break and continue).

UNIT III

INTRODUCTION TO EMBEDDED SYSTEMS: Embedded Systems –processors embedded into a system, embedded hardware units and devices in system, embedded software in a system – Embedded System on chip – Design process in embedded systems – Examples of embedded system.

UNIT IV

PIC PROGRAMMING: PIC 16F877 – Features – Device overview and Architecture – WREG register – File Registers – access bank – Status Register – Data types and directives – I/O Ports. Introduction to PIC assembly programming – Assembling and linking – Program counter and program ROM space – RISC architecture –Instruction set

UNIT V

PIC PERIPHERALS: Timers – Capture/ Compare/PWM Module - MSSP: SPI – I^2C – USART - Analog to Digital Converter Module – CPU Special features – Interrupts – WDT.LCD and Keyboard interfacing – ADC, DAC, Stepper motor and 7 Segment display interfacing

TEXT BOOKS:

1. Yashavant P. Kanetkar, "Let Us C", BPB publications, 5th Edition.
2. Brian W. Kernighan & Dennis M. Ritchie, "The C Programming Language", Prentice Hall, 2nd Edition.

REFERENCE BOOKS

1. Raj Kamal, "Embedded Systems Architecture, Programming and Design", Tata McGraw Hill publishing – 2nd Edition.
2. Muhammed Ali Mazidi, "PIC microcontroller and Embedded Systems Using assembly and C for PIC 18", Pearson Education
3. E. Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill, 5th Edition.
4. V Rajaraman, "Computer Programming in C", Prentice Hall India.
5. PIC16F87X datasheet.
6. John B Peatman, "Design with PIC microcontrollers", Pearson Education.

SEMESTER-IV

22. CORE –X: COMPUTER NETWORKS AND OPERATING SYSTEMS

OBJECTIVES:

- To understand the principles of computer networks and operating systems
- To gain the concepts of networks and operating systems
- To get a knowledge in different network layers and IPC
- To know the principles of Linux.

Expected Course Outcomes (CO):

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

CO1	Remembering the networking concepts and illustrate the OSI model.	K1,K3
CO2	Understands the operations of various layers and apply the routing concepts`	K2,K4
CO3	Design the transistors and implementing the biasing concepts and stude the amplifications with its application	K1,K4
CO4	Ability and designing the various layers and its applications .study the UDP/IP Functions and categories the roll of WWW.	K5,K6
CO5	Develops an ability to LINUX COMMANDS ,threads and dead locks.	K4,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	L
CO2	S	M	M	L	S
CO3	M	M	S	M	M
CO4	L	L	M	L	S
CO5	S	L	L	M	S

*S-Strong; M-Medium; L-Low

UNIT I

Data Communication: Introduction –Components –Types of network -Topologies –Protocols –ISO / OSI Model.

UNIT II

Data Link Layer and Network: Layer Error detection and correction –Data Link Control –Data Link Layer Protocols –HDLC –LAN –Bridges -Packet Switching –IP Addressing Methods –Routing.

UNIT III:

Transport Layer and Application: Layer UDP –TCP –Congestion Control –Sockets –DNS –SMTP –MIME –POP –FTP –HTTP -WWW.

UNIT IV:

Operating Systems: Introduction –services –structure –virtual machine –booting –process management –IPC –memory management –dead lock.

UNIT V:

Linux Programming:LINUX: Commands –Shell Scripts –Kernel –Process –Threads –Device Drivers –Introduction to NS2.

TEXT BOOKS

1.K. Muralibabu and L.Agilandeeswari, "Computer Networks", A.R.S. Publications. (Units I, II, III)

2.Achyut. S Godbole, "Operating Systems", Tata McGraw Hill Publising Company Limited, 2ndEdition. (Unit-IV, V)

REFERENCE BOOKS

1.G. S. Mate and S. P Rao Borde, "Operating Systems", Tech Max Publications, 2006.

2.D.M Dhamdhere, "Systems Programming and Operating Systems".3.Shriram K Vasudevan et.al, "Computer Networks", Narosa Publishing House

SEMESTER – IV: 23.ELECTIVE-IV
SEMESTER-IV

24. CORE PRACTICAL-VII: EMBEDDED SYSTEMS AND SIMULATION LAB

OBJECTIVES

- Write simple programs in PIC microcontroller and ARM Processor.
- Understand the functions of peripherals in PIC microcontroller
- Solve the real world problems through embedded System.

Expected Course Outcomes (CO):

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

CO1	Understand the concepts of PIC based embedded systems and ARM based embedded systems.	K1,K3,K4
CO2	Identify the Different Ways operations and designing.	K3,K4,K5
CO3	Develop the coding skills and verifying of outputs .	K4,K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

Mapping with Programme Outcomes:					
PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	M	L	M	S
CO2	S	L	M	M	M
CO3	S	L	S	M	S

*S-Strong; M-Medium; L-Low

LIST OF EXPERIMENTS (Any 10 experiments)

PIC BASED EMBEDDED SYSTEMS

1. Arithmetic and logical operation
2. Single digit timer using seven segment displays.
3. DAC interface.
4. ADC INTERFACE.
5. LCD interface.
6. Stepper motor control.
7. Serial communication using RS232C.
8. PWM
9. 4X4 matrix Keypad interfacing

ARM BASED EMBEDDED SYSTEMS (2148 IC)

1. LED interfacing.
2. 4X4 matrix Keypad interfacing
3. Graphics LCD interface
4. Sensor interfacing using CAN
5. LED interfacing and Switch
6. Keypad interfacing
7. LCD interface (16*2)
8. ADC interface

SEMESTER – IV: 25.PROJECT VIVA-VOCE

SEMESTER-I

ELECTIVE-I: NETWORK AND JAVA PROGRAMMING

OBJECTIVES

- To understand the principles of computer networks and operating systems
- To gain the concepts of networks and its standards.
- To get a knowledge in different network layers and its protocols.
- To know the principles of JAVA and its operators concepts.

Expected Course Outcomes (CO):

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

CO1	Understanding and analyzing about the various networks and its applications .	K1,K2
CO2	Study the characteristics of various OSI layers and applications.	K3,K4
CO3	Discussion and Design the C languages and JAVA languages .	K3,K5
CO4	Ability and to understand classes and objects .	K5,K6
CO5	Developing of packages and its uses .	K3,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	L
CO2	M	M	S	M	M
CO3	M	S	L	S	M
CO4	L	M	M	L	S
CO5	S	L	M	M	S

*S-Strong; M-Medium; L-Low

UNIT I

IT Trends in computer communications and networks- Messages, characters, bit streams, symbols and waveforms-Digital/analog, serial/parallel, simples/half duplex/full duplex – Synchronous/asynchronous-MODEM: Modulation and keying alternatives–Multiplexing alternatives.

UNITII LAYERANDTHEIRFUNCTIONS

OSI Model –Physical Layer –Data Layer –Network Layer –Transport Session and Application Layer. MODEM: Modulation Techniques–Multilevel Transmission

–Advance in Modem. SWITCHING: Circuit Switching –Message Switching

–Compressing.

UNITIII NETWORK HARDWARELAN

LAN Definition –Major Components of LAN –Protocols –IEEE Standards –CSMA/ CD –Token Ring –Token Bus –FDDI –Logical Link Control.

UNIT IV

JAVA Evolution: History – Features – How Java differs from C and C++ - Java and Internet- Simple Java program- Constants- variables – Data types – Operators and Expressions .Decision Making and Branching: If, If. Else, else. If ladder, Switch, operator Decision Making and Looping: While,do,for–jump sinloops-labeled loops. Classes, Objects and Methods.

UNIT V

Arrays, Strings-Interfaces: Multiple Inheritances-Packages :Putting classes together –MultiThreaded Programming-Applet programming.Files: Introduction–concept of streams–Streamclasses–Usingstreams–I/O Classes-Fileclass–I/OExceptions – creation of files-Reading/Writing characters/Bytes.

TEXT BOOKS

1. Data communication and networking–BEHROUZAFOROUZAN.(2NDEDITION).
2. Programming with java(2ndedition).-E.BALAGURUSAMY.

REFERENCE BOOKS

1. Computer networks-ANDREWS.TANENBAUM.
2. High speed networking and internets-William Stallings.
3. Java how to program(5^{th} edn)H.M.DEITEL,P.J.DEITEL.

SEMESTER – I

ELECTIVE-I: MOBILE COMMUNICATION

OBJECTIVES

- To develop a fundamental understanding of mobile Communication Systems.
- To impart knowledge on basics of cell structure and their applications.
- To expose the basics of GSM and telecommunication architecture.

- **Expected Course Outcomes (CO):**

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

CO1	Understanding the concepts of mobile communications and its frequency. Analyze the hand off , cell splitting and frequency reuse .	K1,K3
CO2	Discussion of antennas and its concepts . how the power is controlled and the concepts of MTSO .	K3,K4
CO3	Categorize the multiplexing techniques and its comparisons .	K4,K6
CO4	Ability and to understand the GSM concepts , handoff, Bluetooth and IEEE procedures .	K3.K5
CO5	How to construct intelligence cell and the concepts of macro and micro cells .	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	M	S	M
CO2	S	M	S	M	S
CO3	M	S	S	S	M
CO4	S	L	M	M	S
CO5	S	L	M	S	S

*S-Strong; M-Medium; L-Low

UNIT I – ELEMENTS OF CELLULAR MOBILE SYSTEM : Why Cellular Mobile Telephone System – History of 800 MHZ Spectrum Allocation – Trunking Efficiency – A Basic Cellular System – Operation of Cellular Systems – Maximum Number of Calls Per Hour Per Cell – Maximum Number of Frequency Channels Per Cell – Concept of Frequency Reuse – Hand off Mechanism – Cell Splitting.

UNIT II – CELLULAR ANTENNAS: Equivalent Circuit of Antennas – The Gain and Pattern Relationship – Engineering Antenna pattern – Antennas at Cell Site – Unique situations of Cell Site Antennas- Mobile Antennas – Power Control – Functions of MTSO – Diversity Receiver.

UNIT III – MEDIUM ACCESS CONTROL : Multiplexing – Space Division Multiplexing – Frequency Division Multiplexing – Time Division Multiplexing – Code Division Multiplexing – Spread Spectrum – DSSS-FHSS-SDMA – FDMA – TDMA- Fixed TDM Classical Aloha – Slotted Aloha – CSMA – DAMA – PRMA – RTDMA – Multiple Access with Pollution Avoidance – CDMA – Spread Aloha Multiple access –

Comparison of S/T/F/CDMA.

UNIT IV – MOBILE TELECOMMUNICATON : GSM – Mobile Services – System Architecture – Radio Interface – Protocols- Localization and Calling – Handover – Security – Bluetooth – IEEE 802.11

UNIT V – INTELLIGENT CELL CONCEPTS: What is the Intelligent Cell – Power Delivery in Intelligent Cell – Processing Gain Intelligent Cells – Application of Intelligent Microcell Systems.

TEXT BOOKS

1. Mobile Cellular Telecommunication – William CY Lee – TMH – II Edition.
2. Mobile Communications – Schiller – Pearson – II Edition.

REFERENCE BOOKS

1. Wireless Communications – Stalling – Pearson II Edition.
2. Mobile & Personal Communication Systems & Services - Raj Pandya - PHI – Rs.250/-

SEMESTER-II

ELECTIVE-II: BIOMEDICAL INSTRUMENTATION

OBJECTIVES

- To impart the knowledge about bio medical electrodes and transducers.
- To familiarize in bio medical recorders.
- To learn the important bio medical instruments.

Expected Course Outcomes (CO):

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

CO1	Identify the various biomedical electrodes . understand the ECG,EEG and EMG electrodes with its advantages .	K1,K3
CO2	Designing of basic recoding systems . study the operations of various blocks of recording system.	K3,K4
CO3	Understand the concept of blood flow meter .study the concepts of PcO2. Study the concepts of blood cell count .	K4,K5
CO4	Ability and to understand the concepts of x ray machine , CT scanner and NMR.	K3,K6
CO5	Designing of endoscopy, pacemaker and defibrillator block diagrams and its functions .	K4,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	L
CO2	M	M	S	M	L
CO3	M	S	S	M	M
CO4	L	M	M	M	S
CO5	S	M	S	L	S

*S-Strong; M-Medium; L-Low

UNIT I :ELECTRODES & TRANSDUCERS

Resting and action potential –components of man -Origin of bioelectric signals – recording electrodes– skin contact impedance – electrodes for ECG – electrodes for EEG –electrodes for EMG – electrical conductivity of electrode jellies and cream– transducersforbiomedicalparameters(table)– pressuretransducers–pulsesensors

– Respiration sensors

UNIT II: BIOMEDICAL RECORDERS

Basic recording system – general considerations for bioelectric recorder amplifiers – sources of noise in low level recording circuits–pre amplifiers–main amplifier and driver stage–writing systems– electrocardiograph–phonocardiograph

–electroencephalograph –Electromyography

UNIT III: MEASUREMENT & ANALYSIS TECHNIQUES IN BLOOD

Blood flow meters : Electro magnetic blood flow meter –Blood gas analyzers: blood pH measurement

– measurement of blood pCO2 – blood pO2 measurement- Blood cell counters: methods of cell counting – coulter counters - automatic recognition and differential counting of cells

UNIT IV: MODERN IMAGINGSYSTEMS

X-raymachine–CTscanner:basicprinciple–contrastscale–systemcomponents– NMR: principles of NMR imaging – image reconstruction techniques – discrimination based on relaxation rates – basic NMR components – applications, biological effects and advantages of NMR imaging system

UNIT V: ADVANCES IN BIOMEDICAL INSTRUMENTATION

Pacemakers- artificial heart valves – defibrillators - ventilators– audiometers – anesthesia machine – angiography – endoscope –cryogenic surgery

TEXT BOOKS

1. Dr.M.Arumugam, "Bio medical instrumentation"
2. Leslie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, "Biomedical instrumentation "

REFERENCE BOOKS

1. .R. S. Khandpur, "Handbook of biomedical instrumentation", Tata McGraw-Hill publisher, New Delhi

SEMESTER - II

ELECTIVE-II: ROBOTICS AND AUTOMATION

OBJECTIVES

- To impart the knowledge about voltage regulation.
- To familiarize in MSP.
- To learn the important of UART and supporting circuits .

Expected Course Outcomes (CO):

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

CO1	Understanding and analyzing about the DC motor , battery , voltages and energy.	K2,K3
CO2	Justification of assembler , debugger and software design. GPIO programming and its applications .Analyze the various interfacing concepts .	K1,K4
CO3	Design the timers , PWM and duty cycle concepts , interrupts and sensor/black box recorder. Understand the concepts of LCD Interface .	K3,K4
CO4	Ability and to understand spin motor techniques . study the Data Acquisition System.	K5,K6
CO5	Designing the Bluetooth , wireless , communication concepts ,wi-fi with its applications .	K3,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	L
CO2	L	M	S	M	S
CO3	M	S	M	S	M
CO4	S	M	L	M	L
CO5	S	L	M	S	M

*S-Strong; M-Medium; L-Low

UNIT-I

Overview of Basic Electronics Review of Voltage – Current – Power – Energy - Resistor – Measuring the reactance of a capacitor – Inductor – Measure LED response curve – Fundamentals of DC Motor – DC Motor Interface – Robot moving in a preset pattern - Battery – Voltage regulation – Connecting motor driver and power distribution board.

UNIT-II

Introduction to MSP432 Programming Assembler – Linker - Debugger – ARM Cortex-M architecture – Debugging the solution, visualization, breakpoint and step – Software design using MSP432 - General purpose I/O – GPIO programming – Demonstration of the lab solution and testing the line sensor – Interfacing I/O LEDs – Interfacing switches and LEDs and debugging.

UNIT-III

Sys Tick Timer and Interrupt Functions Sys tick timer – PWM – Running heartbeat by

adjusting the duty cycle – Running sine wave output to adjust power - Debugging real time systems: Theory – Interrupts – Sys Tick Interrupts – Running the line sensor/black box recorder- LCD Interface.

UNIT-IV

Timers and Data Acquisition Timers: Periodic Interrupt – PWM – Timer generated PWM outputs to spin motors – Interrupt Latency. Data Acquisition System: Theory – Performance measurements – Testing IR measurements using ADC.

UNIT-V

Communication Functions Tachometer: Input Capture – Interface – Testing the Tachometer – Introduction to Control System – Demonstrating Integral Control – Serial Communication: FIFO – UART – Command Interpreter - Bluetooth Low Energy: Theory – Wireless – SNP – Demonstrating BLE – Communicating with the robot – Wi-Fi.

Text Books:

1. Robotics Programming - Technical Manual – TI.

SEMESTER –III

ELECTIVE-III: INTERNET OF THINGS

OBJECTIVES

- To provide a good understanding of Internet of Things (IoT) .
- To provide a overview about the various protocol standards .
- To impart knowledge in the design and development of IoT systems with enablement ensuring security.

Expected Course Outcomes (CO):

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

CO1	Understanding the IoT Design Methodology , IoT Platforms , IoT Network and Cloud Services and IoT Applications .	K2,K4
CO2	Justification of wired and Wireless Communication & Network Protocols 802.11, BLE,NFC , LORA and Zigbee. Study the concepts of Wireless Sensor and adhoc Networks, Optimization,Industrial and Automotive Networks and QoS in IoT Systems.	K2,K3
CO3	Design the embedded devices, Embedded Hardware, Connected Sensors and Actuators . study the Controllers , Battery Life Conservation and designing with Energy Efficient Devices . Understand the concepts of SoCs, CC32XX Architecture and CC32XX Launch pad for Rapid Internet timers .	K3,K5
CO4	Ability and to understand IoT Software Architecture ,Operating Systems for IoT Applications and Building Android Applications. The recommendation of Components for IoT Applications. Introduction to Embedded Linux.	K4,K6
CO5	Evaluation the management of data in the context of the Internet of Things Specific topics include Data sources in IoT and Data Types in IoT. Study the various applications.	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	M	L
CO2	S	S	L	M	S
CO3	M	M	S	M	S
CO4	L	M	M	M	S
CO5	S	S	L	S	S

*S-Strong; M-Medium; L-Low

UNIT-I:

Introduction to IoT and Cyber-Physical Systems IoT Enabling Technologies - Different Levels of IoT Systems - IoT Design Methodology - Introduction to IoT Platforms and End Devices - Introduction to IoT Network and Cloud Services - IoT Applications - Design Challenges - Basic Architecture and Components.

UNIT-II

Wireless Communication & Network Protocols 802.11 - BLE - NFC - LORA - Zigbee - Wireless Sensor and adhoc Networks – Cross - Layer Protocol Optimization - Industrial and Automotive Networks – VANETS - Security issues and QoS in IoT Systems.

UNIT-III:

System Design of Connected Devices Embedded Devices - Embedded Hardware - Connected Sensors and Actuators – Controllers - Battery Life Conservation and designing with Energy Efficient Devices – SoCs - CC32XX Architecture - CC32XX Launch pad for Rapid Internet Connectivity with Cloud Service Providers.

UNIT-IV:

IoT Software Architecture Operating Systems for IoT Applications - Building Android Applications - Building IoT Applications using CC32XX and Beagle Bone Black - Building Server Side Components for IoT Applications – Introduction to Embedded Linux.

UNIT-V :

Management of data in the context of the Internet of Things Specific topics include Data sources in IoT and Data Types in IoT - Data-centric IoT products - Flow of Data - Challenges in managing IoT Data - Data Models and Data acquisition in Sensor Networks - Query Processing and Query Optimization in sensor networks - Sensor Data Cleaning and Storage - Mining Data Streams – Clustering, Classification - Frequent Pattern Mining - Change Detection - Dimensionality Reduction – Forecasting.

TEXT BOOKS

1. Joe Biron & Jonathan Follett, “Foundational Elements of an IoT Solution – The Edge, The Cloud and Application Development”, Oreilly, 1st Edition, 2016.

2. Elizabeth Goodman, Alfred Lui, Martin Charlier, Ann Light, Claire Rowland, “Designing Connected Products”, 1st Edition.

3. Lucas Darnell, “The Internet of Things (A Look at Real World Use Cases and Concerns)”, Kindle Edition, 2016.

REFERENCES BOOKS

1.The Internet of Things – Opportunities and Challenges, http://www.ti.com/ww/en/

internet_of_things /pdf/14-09-17-IoTforCap.pdf

2. Single Chip Controller and Wi-Fi SOC, http://www.ti.com/lit/ds/symlink/cc3200.pdf

3. Wireless Connectivity Solutions

SEMESTER - III

ELECTIVE-III: ANDROID DEVELOPMENT TOOLS AND APPLICATTIONS

OBJECTIVES

- To provide a good understanding of android.
- To provide a overview about the various embedded devices.
- To impart knowledge in the design and development of audio , video and camera.

Expected Course Outcomes (CO):

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

CO1	Understanding and analyzing the concepts of android tools	K2,K3
CO2	Justification of debugging and its applications .Analyze the various debugging concepts .	K1,K3
CO3	Ability to differentiate the various tools and its priorities .	K3,K4
CO4	Understand and develop the skills of audio, video and camera.	K2,K6
CO5	Designing the real time applications for ticket booking ,bank applications and other government related applications .	K4,K6

K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** – Create

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	L	L	M	L	M
CO2	M	S	M	L	S
CO3	M	S	L	L	M
CO4	L	M	M	S	L
CO5	S	L	M	S	M

*S-Strong; M-Medium; L-Low

UNIT -I

Introduction to Android

Background – Platform for Mobile Development – Native Android Applications – Android SDK Features – Open Handset Alliance – Android in Mobile –Introducing the Development Framework: Android Software Stack – The Dalvik Virtual Machine – Android Application Architecture.

UNIT- II

Developing for Android

Downloading and Installing the Android SDK – Developing with Eclipse – Using the Android Developer tools Plug-In for Eclipse – Support Package.First Android Application: New Android Project – Android Virtual Device – Launch Configurations – Running and Debugging Android Application – Types of Android Applications – Android Development Tools.

UNIT- III

Mobile and Embedded Devices

Hardware-Imposed Design Considerations- User's Environment - Developing for Android – Introduction to Android Development Tools.Applications and Activities: Role of Android Application – Application Manifest File–Manifest Editor in Android Application Lifecycle – Application's priority and its process states.

UNIT- IV

Audio, Video and Camera

Playing Audio and Video – Manipulating Raw Audio – Creating a Sound Pool – Using Audio Effects – Camera for taking Pictures – Recording Video – Adding Media to the Media Store.

UNIT – V

Real time Applications

Bluetooth – Network and Internet Connectivity –Wi-Fi – Transferring Data using Wi-Fi Direct – Near Field Communication (NFC) – Online ticket booking – Online payment options – e-Electronics & Simulations – Online shopping – Government oriented applications – Bank Applications – Other Applications.

TEXT BOOKS

1. Reto Meier. 2012. Professional Android 4 Application Development. Wiley India Pvt Ltd.

REFERENCE BOOKS

1. Paul Deitel, Harvey Deitel, Abbey Deitel and Michael Morgano. Android for Programmers An App-Driven Approach.
2. Frank Ableson, W., Robi Sen, Chris King and Enrique Ortiz, C. 2012. Android in Action.

[Third Edition]. Manning Publications, U.S Charlie Collins and Michael Galpin. 2012. Android in Practice. Manning Publications Co.

3. Zigurd Mednieks and Laird Dornin. 2011. Programming Android O'Reilly Media, Inc, NewYork.
4. Google Play store.measurements", 2ndedition, Prentice Hallof Indiapvtltd.

SEMESTER - IV

ELECTIVE-IV: AUTOMOTIVE ELECTRONICS

OBJECTIVES

- To know fundamentals of Automotive Electronics, fuel injection and ignition systems.
- To provide knowledge about application of electronics in Automobile engineering.
- To impart knowledge about automotive engines.

- **Expected Course Outcomes (CO):**

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

CO1	Understanding and analyzing the concepts of ignition , stroke , break and steering systems .	K2,K3
CO2	Justification of starting , ignition and fuel consumptions concepts .	K3,K4
CO3	Know the applications of fuel injection programming and controls .	K3,K6
CO4	Ability and to understand ABS , seat bealt application and anti-lock breaking systems .	K4,K6
CO5	Designing and understanding of Protocols CAN,LIN,Flexray, J1850 and Wi-Fi.	K5,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	M	L
CO2	S	M	M	L	S
CO3	M	S	M	L	M
CO4	L	M	M	L	S
CO5	S	L	S	L	M

*S-Strong; M-Medium; L-Low

UNIT-I

Automotive Fundamental –Evolution –Physical Configuration –Automotive Systems -Engine –Engine Block –Cylinder Head –4 Stroke Cycle -Engine Control –Ignition System –Ignition Timing –Suspension –Brakes –Steering System.

UNIT-II

Ignition Systems Starting Systems -Requirements of the Starting Systems - Ignition Systems: Fundamentals –Types –Generation –Timing –Fuel Consumption –Conventional Ignition Components –Plug Leads –Ignition Coil Cores -Introduction to Electronic Ignition system.

UNIT-III

Fuel Injection Overview of Programmed Ignition -Electronics Control of Carburetion –Basics –Areas of Control -Fuel Injection -System Overview -Advantages Of Fuel Injection.

UNIT-IV

Chassis Electrical System Anti-lock Brakes –Introduction –Requirements of ABS –General System Description –ABS components –Anti-lock Brake System Control -Traction Control – Functions –System Operation –Safety Systems: Central Locking -Electric Windows – Airbags and Belt Tensioners

UNIT-V

Protocols CAN –LIN-Flexray –J1850 –KWP 2000 –MOST –BLE –Wi-Fi

TEXT BOOKS

1. William B. Ribbens, "Understanding Automotive Electronics", Society of Automotive Engineers Inc, 6thEdition, 2002
2. Tom Denton, "Automobile Electrical and Electronic Systems", Elsevier Publications Ltd., 4thEdition, 2011.

REFERENCES BOOKS

1. www.flexray.com
2. www.can-cia.org
3. www.interfacebus.com

SEMESTER - IV

ELECTIVE-IV : THIN FILM AND NANO TECHNOLOGY

OBJECTIVES

- To provide knowledge about thin films and preparation techniques.
- To familiarize in nano electronics and nano devices .
- To know the various applications of nano devices .

2. Expected Course Outcomes (CO):

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

CO1	Understanding and analyzing the concepts of vacumn pumps ,gauges and thin film growth.	K2.K3
CO2	Justification of thin film deposition for physical vacuum deposition, e-beam. MBE, sputtering, laser ablation, chemical-CVD MOCVD and Electrochemical deposition.	K1.K5
CO3	Design the concepts of thick film , various properties and adhesion properties .	K4,K6
CO4	Ability and to understand the nano electronics and integrated system concepts .	K3,K5
CO5	Designing the various nano devices and understand the various applications .	K4,K6
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	S	L	L	M	M
CO2	S	M	M	M	S
CO3	M	S	L	S	M
CO4	L	L	M	L	S
CO5	S	M	L	M	S

*S-Strong; M-Medium; L-Low

UNIT I:

Vacuum science and technology: vacuum pumps, gauges, vacuum seals and notion and electrical feed through UHV materials and technology-thin film growth and nucleation growthmodes.

UNIT II:

Thin film deposition techniques: physical vacuum deposition, e-beam. MBE, sputtering, laser ablation, chemical-CVD MOCVD, Electrochemical deposition, plasma assistedtechniques.

UNIT III:

Thick film deposition techniques: screen printing, thickness measurements of films talystep, quartz crystal microbalance, optical methods-mechanical properties and adhesion characterization techniques to determine harness.

UNITIV: NANO ELECTRONICS AND INTEGRATEDSYSTEMS

Basics of nano electronics – Single Electron Transistor – Quantum Computation – tools of micro nano fabrication – nanolithography – quantum electronic devices – MEMS and NEMS – Dynamics of NEMS – limits of integrated electronics.

NIT V: NANODEVICES AND APPLICATIONS

Nano magnetic materials – Particulate Nan magnets and geometrical Nan magnets – Magneto resistance – Probing nano magnetic materials – Nan magnetism in technology – Carbon Nano tubes – fabrication- applications – Organic FET, organic LED's – Organic photovoltaic – Injection lasers, quantum cascade lasers, optical memories, electronicapplications, coulomb blockadedevices.

TEXT BOOKS

1. Kelsall Robert W, Ian Hamley, Mark Geoghegan, "Nanoscale Science and Technology", Wiley Eastern, 2004.
2. Michael Kohler, Wolfgang, Fritzsche, "Nanotechnology: Introduction to Nanostructuring Techniques",2004.
3. William Goddard, Donald W Brenner, "Handbook of Nano Science Engineering and Technology", CRCPress, 2004.
4. Bharat Bhushan,"Springer Handbookof Nanotechnology", 2004.
5. Charles P Poole, Frank J Owens, "Introduction to Nanotechnology", John Wiley and Sons, 2003.

(For Other Major P.G Students In The Second Semester)

EDC: FOR OTHER DEPT STUDENTS (II-SEMESTER)

1. BASIC ELECTRONICS

OBJECTIVES:

- To understand the principles of passive and active electronic devices
- To Gain the basic concepts of OP-amp and timer circuits.
- To get knowledge in digital principles and logic circuits
- To know the working principles of laboratory instruments.

Expected Course Outcomes (CO):

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

CO1	Understanding the symbol ,operations ,applications of diode , transistor , zener diode and amplifiers .	K2,K3
CO2	Justification of inverting , non inverting , comparator , integrated and differentiator circuits .	K1,K3
CO3	Design the solar cell , 555 timer, automatic street light and multivibrators .	K3,K5
CO4	Ability and to understand the digital signals ,logic gates and flip-flops .	K5,K6
CO5	Designing and operations of various digital instruments knowing the concept of various applications.	K4,K5
K1 - Remember; **K2** - Understand; **K3** - Apply; **K4** - Analyze; **K5** - Evaluate; **K6** - Create		

PO/CO	PO1	PO2	PO3	PO4	PO5
CO1	L	L	M	S	L
CO2	M	M	S	L	S
CO3	M	M	S	L	M
CO4	L	L	M	L	S
CO5	S	L	L	M	S

*S-Strong; M-Medium; L-Low

UNIT-I

Semiconductor Devices Introduction – AC and DC – Passive Components: –Resistors, Capacitors & Inductors - Semiconductor - Intrinsic Semiconductor – Extrinsic Semiconductor - PN Junction Diode and its

Characteristics – Half wave, Full wave Rectifier – Zener Diode and its Characteristics – Zener Voltage Regulator - Transistor characteristics – Transistor Biasing - Principle of Transistor Amplifier.

UNIT-II

Operational Amplifier Op-amp and it‟s Parameters – Non-inverting Amplifier – Inverting amplifier – Adder – Subtractor - Comparator –Voltage Level Indicators-- Integrator – Differentiator .

UNIT-III

. Optoelectronics Devices:- Solar Cell ,LDR, Photo transistor Automatic Street Light – 555 Timer - Astable Multivibrator – Monostable Multivibrator.

UNIT-IV

Digital Electronics Number System - Binary – Octal and Hexadecimal – Logic gates:- AND, OR, NOT, NAND & NOR Gates - Half and Full Adder – Four-bit Binary Adder – Flip flops:- RS – Clocked RS , D & JK flip flop – JK Master Slave Flip flop.

UNIT-V Instruments Ammeter – Voltmeter – Potentiometer – pH Meter – Conductivity Bridge – Electrophoresis – Photoelectric Colorimeter – Spectrophotometer – Flame Photometer – Atomic Absorption Spectroscope – Electronic Single Pan Balance Digital Thermometer.

TEXT BOOKS

1. V. K. Mehta, “Principles of Electronics”, S.Chand & Company, New Delhi, 4th Edition, 1995 (Unit-I)

2. K. R. Botkar, “Integrated Circuits”, Khanna Publishers, New Delhi, 8th Edition.(Unit-II)

3. Albert Paul Malvino and Donald P Leach, “Digital Principles and Applications”, McGraw Hill, 4th Edition, 1986. (Unit-III &IV)

4. C. S. Rangan, G. R Serma,V. S. V. Mani., “Instrumentation Devices and Systems”. (Unit-V)

REFERENCE BOOKS

1. R. S. Sedha, “A Text Book of Applied Electronics”, S. Chand and Company Ltd, 2005.

2. Robert L.Boylestad, Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Prentice Hall, 10th Edition, 2009.

3. P. Raja, “Digital Electronics”, Scitech Publications (India) Pvt., Ltd., 2017. A. K. Srinivasthav and P. L. Jain, “Chemical analysis an Instrumental Approach.”