ANNAMACHARYA UNIVERSITY

EXCELLENCE IN EDUCATION; SERVICE TO SOCIETY

(ESTD, UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)

Rajampet, Annamayya District, A.P – 516126, INDIA

MEETING MINUTES

of

BOARD OF STUDIES

ACADEMIC YEAR: 2024-25

Date & Time: 27/08/2024 & 03:00PM

Venue: PG Block

Ref.No.:/AU/SoE/ECE/BoS-01/2024-25/MoM-01 Date: 27/08/2024

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

1st BoS Minutes of Meeting

The 1st meeting of the Board of Studies (BoS) for the Department of Electronics and Communication Engineering was held in hybrid mode on 27th August 2024 in Room No. 324 of the PG Block at 3:00 PM, with the following members of the board present.

Members Present:

Sl.No	Name	Affiliation	Role in BoS
1.	Dr.CH.Nagaraju	Professor & Head, Dept. of ECE, Annamacharya University, Rajampet Ph:9989994021 Email:chrajuaits@gmail.com	Chairman
2.	Dr.J.Chinna Babu	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:886404835 Email:jchinnababu@gmail.com	Senior Faculty-Member
3.	Dr.C.Venkatesh	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:9985032919 Email:venky.cc@gmail.com	Senior Faculty-Member
4.	Dr.K.Riyazuddin	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:9885648459 Email:riyazoo2002@yahoo.co.in	Course Coordinator-Member
5.	Dr.S.Karimullah	Assistant Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:8978078010 Email:munnu483@gmail.com	Course Coordinator-Member
6.	Dr.N.N.Murthy	Professor, IIT Tirupathi. Ph:9439429709 Email:nnmurty@iittp.ac.in	Subject Expert-Member
7.	Dr.N.Balaji	Professor, Department of ECE JNTUK, Kakinada. Ph:9502441555 Email:prof.balaji.ece@gmail.com	Subject Expert-Member
8.	Dr.N.Sreekanth	Professor & Head, Dept. of ECE Mallareddy University, Hyderabad, Telangana. Ph:9603709796 Email:nsreeku@gmail.com	University Nominee-Member

9.	Mr. Vikas Reddy Rapuru	Director, Technotron, Hyderabad, Telangana. Ph:9703047292 Email:vikas@technotran.in	Industry Representative-Member
10.	Mr. Syed Javeed Basha	Design Verification Engineer, SmartSOC Pvt.Ltd., Bangalore, Karnataka Ph:8328623437 Email:sydjaveev221@gmail.com	Alumni Representative-Member

Members of Absence: NIL

Agenda of the Meeting:

Item No	Particulars
BoS/2024/ECE/1.1	Welcome and Introduction.
BoS/2024/ECE/1.2	Review and Approval of First-Year B.Tech. Course Structure and Syllabi under AU24 Regulations.
BoS/2024/ECE/1.3	Introduction of New Programs (if applicable).
BoS/2024/ECE/1.4	Review and Approval of M.Tech Course Structure and Detailed Syllabi under AU24 Regulations.
BoS/2024/ECE/1.5	Discussion on the Inclusion of Industry-Relevant Courses and Emerging Technologies for Upcoming 2nd, 3rd, and 4th Years under AU24 Regulations.
BoS/2024/ECE/1.6	Discussion and Approval of the Annamacharya University Research Admission Test -2024 (AURAT) syllabus for the Electronics and Communication Engineering.
BoS/2024/ECE/1.7	Discussion and Approval of the course work, including Core subjects and Research Methodology, for Research Programs.
BoS/2024/ECE/1.8	Approval of the List of Examiners for First-Year Courses/Subjects.
BoS/2024/ECE/1.9	Any other item with permission of the Chair.

MINUTES OF THE MEETING

Agenda Item No. BoS/2024/ECE/1.1: Welcome and Introduction

Welcome:

Dr CH.Nagaraju, Head, Department of Electronics and Communication Engineering has extended warm welcome to all the members.

Introduction:

At the outset, Dr CH.Nagaraju, Head, Department of Electronics and Communication Engineering introduced all the members of the Board of Studies and thanked them for accepting the invitation to the 1st BoS meeting.

The Chairman has presented the Vision, Mission, Program Educational Objectives, Program outcomes and Program Specific Outcomes of the B.Tech Electronics and Communication Engineering. After the discussion the members resolved to approve the Vision, Mission, PEOs, POs & PSOs.

Vision of the Department:

"To become a leading global center for Electronics and Communication Engineering, dedicated to driving technological innovation and adopting new methods, while providing education that supports the progress of society".

Mission of the Department:

M1 - To provide a quality education in Electronics and Communication Engineering that promotes research, innovation, and critical thinking skills.

M2 - To develop skilled and ethical professionals by providing an inclusive and supportive learning environment that values integrity and creativity.

M3 - To accelerate technical innovation and improve industry readiness by combining cutting-edge research with hands-on experience, addressing current challenges, and contributing to societal improvement.

Resolution:

The BOS members resolved and approved the Vision, Mission, PEOs, POs and PSOs of the Electronics and Communication Engineering.

The Vision, Mission, PEOs, POs and PSOs are stated in the Annexure-I.

Agenda Item No. BoS/2024/ECE/1.2: Review and Approval of First-Year B.Tech Course Structure and Syllabi under AU24 Regulations

Dr.CH.Nagaraju presented the First-Year course structure and syllabi to the members. The following discussions are made.

Dr.N.Balaji, Subject expert, suggested to add two more additional experiments beyond the syllabus in "Electronic Devices and circuits lab" course offered for ECE department and "Fundamentals of Electronic Devices and Circuits lab" course offered for EEE department.

He also suggested that to replace the experiment "Input and Output Characteristics of Transistor in CB Configuration" by "Input and Output Characteristics of Transistor in CC Configuration" in Fundamentals of Electronic Devices and Circuits lab course offered for EEE department.

Resolution:

After the deliberations the members of BoS accepted to include two more additional experiments beyond the syllabus in "Electronic Devices and circuits lab" and "Fundamentals of Electronic Devices and Circuits lab" courses.Also, the members of BoS accepted to replace the experiment "Input and Output Characteristics of Transistor in CB Configuration" by "Input and Output Characteristics of Transistor in CC Configuration" in Fundamentals of Electronic Devices and Circuits lab course offered

for EEE department. The members unanimously approved the First-Year Course Structure & Syllabi under AU24 regulations.

The First-Year course structure and detailed syllabi of Electronics and Communication Engineering Department is shown in Annexure-II.

Agenda Item No. BoS/2024/ECE/1.3: Introduction of New Programs.

The Chairman of Board of Studies opened the discussion on introduction of new programs in the department. The deliberations are made on applying for new programmes like Electronics and Computer Science Engineering, Electronics and VLSI, Embedded and IoT , Diploma and Certification courses etc. keeping the available resources in the department.

Resolution:

After the discussions the members encouraged to apply for the new programmes based on the resources available and keeping the thrust areas in the mind for the next academic year.

Agenda Item No. BoS/2024/ECE/1.4: Review and Approval of M.Tech Course Structure and Detailed Syllabi under AU24 Regulations.

M. Tech Course Structure and detailed Syllabi of Embedded Systems has been presented by Dr. CH.Nagaraju for discussion among the members of the Board of Studies of Electronics and Communication Engineering.

The chairman suggested that post-graduate students should enroll in a 12-week MOOC courses (Massive Open Online Course) offered by any recognized platform. He also proposed that a student's enrolment in a MOOC should be based on the recommendation of a committee constituted by the Head of the Department.

Resolution:

After the deliberations the members approved the M.Tech Course Structure and detailed syllabi under AU24 Regulations.

M.Tech Course Structure and detailed syllabi under AU24 Regulations are provided in Annexure-III.

Agenda Item No. BoS/2024/ECE/1.5: Discussion on the Inclusion of Industry-Relevant Courses and Emerging Technologies for Upcoming 2nd, 3rd, and 4th Years under AU24 Regulations.

The Chairman of Board of Studies opened the discussion on the inclusion of industry-relevant courses and emerging technologies specifically for the Electronics and Communication Engineering (ECE) program under the AU24 regulations for the upcoming 2nd, 3rd, and 4th-year students.

Mr. Vikas Reddy Rapuru, Industry representative and Mr. Syed Javeed Basha, Alumni representative suggested to incorporate advancements in areas such as 5G communications, Internet of Things (IoT), artificial intelligence, machine learning, Deep learning and VLSI design.

Resolution:

The members suggested to include the Industry-Relevant Courses while framing the courses for 2nd, 3rd and 4th year course structure.

Industry-Relevant Courses are listed in the Annexure- IV

Agenda Item No. BoS/2024/ECE/1.6: Discussion and Approval of the Annamacharya University Research Admission Test -2024 (AURAT) syllabus for the Electronics and Communication Engineering.

Dr.CH.Nagaraju, BoS chairman, presented the syllabus of Electronics and Communication Engineering. for Research admission test i.e., AURAT-2024.

Dr.N.Balaji, Subject expert, suggested to change the title "Communications" in unit-IV as "Communication Engineering" in the Research Admission Test-2024 (AURAT) syllabus for the Electronics and Communication Engineering.

Resolution:

Members unanimously approved the syllabus of Electronics and Communication engineering for Research admission test.

Research Admission Test-2024 (AURAT) syllabus for the Electronics and Communication Engineering are provided in Annexure-V.

Agenda Item No. BoS/2024/ECE/1.7: Discussion and Approval of the course work, including Core subjects and Research Methodology, for Research Programs.

Dr.CH.Nagaraju, Chairman of BoS presented the syllabus of Research methodology, Research publications and ethics. He also presented the course work including the core subjects.

BoS members suggested that the core subjects course work selection is based on the Research committee recommendations and their approval apart from the mandatory courses.

Resolution:

Members approved the syllabus for research methodology, research publications and ethics courses and also approved the list of core subjects.

List of core subjects is provided in Annexure- VI

Agenda Item No. BoS/2024/ECE/1.8: Approval of the List of Examiners for First-Year Courses/Subjects.

The chairman presented the list of examiners for First-Year courses. Members suggested to follow the guidelines as per the norms of the University.

List of Examiners are provided in the Annexure- VII

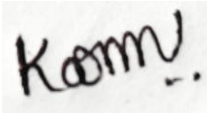
Agenda Item No. BoS/2024/ECE/1.9: Any other item with permission of the Chair.

As all items in the agenda have been discussed and resolved, the chairman of the BoS concluded that there are no other items to be discussed.

The Chairman of BoS, Dr. CH. Nagaraju proposed the Vote of Thanks. He individually thanked the BoS Members for their committed participation in the discussions and for their valid inputs to the course and valuable involvement in the syllabus discussions.

Attendance sheet :

BoS Members:

Sl.No	Name	Affiliation	Role in BoS	Signature with Date
1.	Dr.CH.Nagaraju	Professor & Head, Dept. of ECE, Annamacharya University, Rajampet Ph:9989994021 Email:chrajuaits@gmail.com	Chairman	
2.	Dr.J.Chinna Babu	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:886404835 Email:jchinnababu@gmail.com	Senior Faculty-Member	
3.	Dr.C.Venkatesh	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:9985032919 Email:venky.cc@gmail.com	Senior Faculty-Member	
4.	Dr.K.Riyazuddin	Associate Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:9885648459 Email:riyazoo2002@yahoo.co.in	Course Coordinator-Member	
5.	Dr.S.Karimullah	Assistant Professor, Dept. of ECE, Annamacharya University, Rajampet Ph:8978078010 Email:munnu483@gmail.com	Course Coordinator-Member	
6.	Dr.N.N.Murthy	Professor, IIT Tirupathi. Ph:9439429709 Email:nnmurty@iittp.ac.in	Subject Expert-Member	Attended Online
7.	Dr.N.Balaji	Professor, Department of ECE JNTUK, Kakinada. Ph:9502441555 Email:prof.balaji.ece@gmail.com	Subject Expert-Member	Attended Online

8.	Dr.N.Sreekanth	Professor & Head, Dept. of ECE Mallareddy University, Hyderabad, Telangana. Ph:9603709796 Email:nsreeku@gmail.com	University Nominee-Member	Attended Online
9.	Mr. Vikas Reddy Rapuru	Director, Technotron, Hyderabad, Telangana. Ph:9703047292 Email:vikas@technotran.in	Industry Representative-Member	Attended Online
10.	Mr. Syed Javeed Basha	Design Verification Engineer, SmartSOC Pvt.Ltd., Bangalore, Karnataka Ph:8328623437 Email:sydjaveev221@gmail.com	Alumni Representative-Member	Attended Online

ANNEXURE-I

VISION

To become a leading global center for Electronics and Communication Engineering, dedicated to driving technological innovation and adopting new methods, while providing education that supports the progress of society.

MISSION

- To provide a quality education in Electronics and Communication Engineering that promotes research, innovation, and critical thinking skills.
- To develop skilled and ethical professionals by providing an inclusive and supportive learning environment that values integrity and creativity.
- To accelerate technical innovation and improve industry readiness by combining cutting-edge research with hands-on experience, addressing current challenges, and contributing to societal improvement.

PROGRAM OUTCOMES (POs)

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, electronics and communication engineering fundamentals to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAMME EDUCATIONAL OBJECTIVES

PEO1: Work efficiently as Electronics & Communication Engineers, including supportive and leadership roles on Multidisciplinary teams.

PEO2: Communicate effectively, recognize and incorporate societal needs and constraints in their professional endeavors with high regard to legal and ethical responsibilities.

PEO3: Develop attitude in lifelong learning, applying and adapting new ideas and technologies as their field evolves.

PROGRAM SPECIFIC OUTCOMES

PSO1: Professional Skills: An ability to understand the basic concepts in electronics and communication engineering and to apply them to various areas like electronics, communication, signal processing, VLSI, embedded systems etc., in the design and implementation of complex systems

PSO2: Successful Career and Entrepreneurship: An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an entrepreneur.

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ANNEXURE-II

I YER COURSE STRUCTURE AND DETAILED SYLLABI

Semester I (First year)

Sl.No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1.	BS	24AEEE11T	Basic Electrical and Electronics Engineering	3	0	0	3
2.	BS	24ACHE12T	Chemistry	3	0	0	3
3.	BS	24AMAT11T	Matrix Theory and Calculus	3	0	0	3
4.	ESC	24ACSE11T	Computational Problem Solving	3	0	0	3
5.	ESC	24AMEC11T	Engineering Drawing	1	0	4	3
6.	BS (LAB)	24AEEE11L	Basic Electrical and Electronics Engineering Lab	0	0	2	1
7.	BS (LAB)	24ACHE12L	Chemistry Lab	0	0	2	1
8.	ESC (LAB)	24ACSE11L	Computational Problem Solving Lab	0	0	2	1
9.	HSM	24ALAN11T	Foreign Language Elective	1	0	0	1
						Total credits	**19**

Semester II (First year)

Sl.No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	C
1	BS	24APHY22T	Applied Physics	3	0	0	3
2	BS	24AMAT22T	Differential equations and Transform Techniques	3	0	0	3
3	HSM	24AENG21T	English for Engineers	3	0	0	3
4	ESC	24AECE22T	Electronic Devices & Circuits	3	0	0	3
5	ESC	24AEEE23T	Network Analysis	3	0	0	3
6	ESC	24AMEC22L	Engineering & IT Workshop	2	0	0	0
7	BS (LAB)	24APHY22L	Applied Physics Lab	0	0	2	1
8	HSM (LAB)	24AENG21L	English Language Communication Skills Lab	0	0	2	1
9	ESC (LAB)	24AECE22L	Electronic Devices & Circuits Lab	0	0	2	1
						Total Credits	**21**

Title of the Course	Electronic Devices and Circuits
Category	ESC
Couse Code	24AECE22T

Year	I B.Tech.
Semester	II Semester
Branch	ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the concepts of biasing and stabilization in BJT
- To understand the concepts of FET, MOSFET and their biasing techniques.
- To analyze the parameters like gain and impedances for single stage amplifier circuits.
- To understand the small signal analysis of BJT and FET Amplifiers.
- To understand the working principles of special purpose electronic devices.

Unit 1 Biasing & Stability **9**

Overview of BJT Configurations, Transistor Amplifying Action – Load Line Analysis of AC & DC – Operating Point. Types of Biasing: Fixed Bias – Emitter Bias – Emitter Feedback Bias - Collector to Base bias – Voltage Divider Bias. Bias Stability: Need for Stabilization – Stabilization Factors (s, s', s'') – Stability Factors for Voltage Divider Bias - Thermal Stability and Thermal Runaway – Heat Sinks.

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to understand the concepts of stability and biasing of BJT(L2)
- Able to find the stability factor of different biasing techniques of BJT(L2)
- Understand the concepts of thermal stability, Run away and heat sinks (L2)

Unit 2 Field Effect Transistors & Its Biasing **9**

Construction of JFETs–Transfer Characteristics–FET Biasing: Fixed Bias Configuration–Self Bias Configuration–Voltage Divider Biasing–Construction and Characteristics of MOSFETs–Depletion type MOSFETs–Enhancement type MOSFETs-Biasing in MOSFETs.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the construction and operation of JFET and MOSFET (L2)
- Able to design different biasing for JFET and MOSFET (L6)

Unit 3 The Transistor at Low frequencies **9**

Graphical Analysis of the CE Configuration, Two port devices and the hybrid model, Transistor hybrid model, the h-parameters , Analysis of a transistor amplifier circuit using h-parameters (Exact Analysis), Illustrative problems

Learning Outcomes: At the end of the unit, the student will be able to:

- Able to understand single stage transistor amplifier and it's operation (L2)
- Able to understand the concepts of h-parameters (L2)

Unit 4 FET Amplifiers **9**

Small signal model of JFET and MOSFET – Common source and common Drain amplifiers using FET.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concepts of small signal model of JFET and MOSFET (L2
- Able to identify different parameters of JFET and MOSFET (L3)

Unit 5 Special Purpose Electronic Devices **9**

LED, Photodiode, Phototransistor, PIN Diode, Tunnel Diode, Varactor diode, SCR, UJT

Learning Outcomes: At the end of the unit, the student will be able to

- Able to understand the construction and operation of different special purpose devices
- Able to identify different symbols of special purpose electronic devices.

Prescribed Text Books:

1. Electronic Devices and Circuits, David A Bell, Fifth Edition, 2008, Oxford University Press.
2. Electronic Devices and Circuits, J. Millman and Halkias, 1991 edition, 2008,TMH.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 9th edition,PHI.
2. Principles of Electronics, V. K. Mehta, S. Chand Publications2004
3. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and Halkias,TMH.
4. Micro Electronic Circuits, Sedra and Smith, Oxford UniversityPress

Course Outcomes (CO):

Upon completion of the course, the students will be able to:	Blooms Level of Learning
1. Comprehend the Biasing and Stabilization conditions of BJT.	L2
2. Comprehend Biasing and Stabilization conditions of FET.	L2
3. Design the amplifiers circuits under given requirements.	L4
4. Comprehend the Small signal model of BJT and FET	L2
5. Discuss the usage of special purpose electronic devices in various applications.	L2

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
24AECE22T.1	3	3	1	1	-	-	3	-	-	-	-	1
24AECE22T.2	3	3	1	1	-	-	3	-	-	-	-	1
24AECE22T.3	2	2	3	3	-	-	2	-	-	-	-	1
24AECE22T.4	3	3	2	2	-	-	3	-	-	-	-	1
24AECE22T.5	3	3	2	2	-	-	1	-	3	-	-	1

Title of the Course Electronic Devices and Circuits Lab
Category ESC
Couse Code 24AECE22L

Year I B.Tech.
Semester II Semester
Branch ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	2	1

Course Objectives:

- To determine characteristics of JFET, MOSFET, SCR and UJT.
- To determine parameters like gain, impedances and band width of BJT and FET amplifier circuits.

Perform any 10 Experiments:

1. Identification, Specifications and Testing of Active Devices, Low power JFETs, MOSFETs, Photodiode, Phototransistor, SCR and UJT.
2. Input and Output Characteristics of Transistor CE Characteristics.
3. Input and Output Characteristics of Transistor CB Characteristics.
4. Input and Output Characteristics of Transistor CC Characteristics.
5. JFET Characteristics.
6. MOSFET Characteristics
7. Frequency response of CE Amplifier.
8. Frequency response of CC Amplifier.
9. Frequency response of Common Source FET Amplifier.
10. SCR Characteristics.
11. UJT Characteristics.
12. Photodiode and Phototransistor Characteristics
13. Soldering Practice.
14. RC Coupled Amplifier
15. RC Differentiator and Integrator Circuits

Course Outcomes (CO):

Upon completion of the course, the students will be able to:	Blooms Level of Learning
1. Gain the knowledge and practical usage of JFET, MOSFET and some special electronic devices.	L2
2. Design the amplifier circuits under given requirements.	L6

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Modern tool usage	The engineer and society	Environment and sustainability	Ethics	Individual and team work	Communication	Project management and finance	Life-long learning
24AECE22L.1	2	2	1	-	-	-	-	-	-	-	-	1
24AECE22L.2	2	2	1	-	-	-	-	1	-	-	-	1

Title of the Course:	Electronic Devices and Circuits Lab
Category:	ESC (LAB)
Semester:	II Semester
Couse Code:	24AECE22L
Branch/es:	ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	2	1

Course Objectives:

1. To determine characteristics of JFET, MOSFET, SCR and UJT.
2. To determine parameters like gain, impedances and band width of BJT and FET amplifier circuits.

Course Outcomes:

At the end of the course, the student will be able to

1. Comprehend the specifications of active electronic devices.
2. Comprehend the BJT Input and output characteristics
3. Gain the knowledge and practical usage of JFET, MOSFET.
4. Analyze various biasing circuits and electronic circuits as amplifiers.
5. Plot the characteristics of electronic devices.

LIST OF EXPERIMENTS: (Execute any 10 experiments)

1. Identification, Specifications and Testing of Active Devices, Low power JFETs, MOSFETs, Photodiode, Phototransistor, SCR and UJT.
2. Input and Output Characteristics of Transistor CE Characteristics.
3. Input and Output Characteristics of Transistor CB Characteristics.
4. Input and Output Characteristics of Transistor CC Characteristics.
5. JFET Characteristics.
6. MOSFET Characteristics
7. Frequency response of CE Amplifier.
8. Frequency response of CC Amplifier.
9. Frequency response of Common Source FET Amplifier.
10. SCR Characteristics.
11. UJT Characteristics.
12. Photodiode and Phototransistor Characteristics
13. Soldering Practice.
14. RC Coupled Amplifier
15. RC Differentiator and Integrator Circuits

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the World	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning
24AECE22L.1	3	2	1	2	-	-	1	3	-	-	-
24AECE22L.2	3	2	1	2	-	-	1	3	-	-	-
24AECE22L.3	3	2	1	2	-	-	1	3	-	-	2
24AECE22L.4	3	3	2	3	-	-	1	3	-	-	3
24AECE22L.5	2	1	1	1	-	-	1	2	-	-	-

Title of the Course:	Electronic Devices and Circuits
Category:	ESC
Semester:	II Semester
Couse Code:	24AECE22T
Branch/es:	ECE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To understand the concepts of biasing and stabilization in BJT
2. To understand the concepts of FET, MOSFET and their biasing techniques.
3. To analyze the parameters like gain and impedances for single stage amplifier circuits.
4. To understand the small signal analysis of BJT and FET Amplifiers.
5. To understand the working principles of special purpose electronic devices.

Course Outcomes:

At the end of the course, the student will be able to

1. Comprehend the Biasing and Stabilization conditions of BJT.
2. Comprehend Biasing and Stabilization conditions of FET.
3. Design the amplifiers circuits under given requirements.
4. Comprehend the Small signal model of BJT and FET
5. Discuss the usage of special purpose electronic devices in various applications.

Unit 1 Biasing and Stability **12**

Overview of BJT Configurations, Transistor Amplifying Action – Load Line Analysis of AC & DC – Operating Point. Types of Biasing: Fixed Bias – Emitter Bias – Emitter Feedback Bias - Collector to Base bias – Voltage Divider Bias. Bias Stability: Need for Stabilization – Stabilization Factors (s, s', s'') – Stability Factors for Voltage Divider Bias - Thermal Stability and Thermal Runaway – Heat Sinks.

Unit 2 Field Effect Transistors and its Biasing **12**

Construction of JFETs–Transfer Characteristics–FET Biasing: Fixed Bias Configuration–Self Bias Configuration–Voltage Divider Biasing–Construction and Characteristics of MOSFETs–Depletion type MOSFETs–Enhancement type MOSFETs-Biasing in MOSFETs.

Unit 3 Transistor at Low Frequencies **12**

Graphical Analysis of the CE Configuration, Two port devices and the hybrid model, Transistor hybrid model, the h-parameters , Analysis of a transistor amplifier circuit using h-parameters (Exact Analysis), Illustrative problems

Unit 4 FET Amplifiers **10**

Small signal model of JFET and MOSFET – Common source and common Drain amplifiers using FET

Unit 5 Special Purpose Electronic Devices **10**

LED, Photodiode, Phototransistor, PIN Diode, Tunnel Diode, Varactor diode, SCR, UJT

Prescribed Textbooks:

1. Electronic Devices and Circuits, David A Bell, Fifth Edition, 2008, Oxford University Press.

2. Electronic Devices and Circuits, J. Millman and Halkias, 1991 edition, 2008,TMH.

Reference Books:

5. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 9th edition,PHI.
6. Principles of Electronics, V. K. Mehta, S. Chand Publications2004
7. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and Halkias,TMH.
8. Micro Electronic Circuits, Sedra and Smith, Oxford UniversityPress

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering tool usage	The engineer and the World	Ethics	Individual and Collaborative team work	Communication	Project management and finance	Life-long learning
24AECE22T.1	3	3	1	1	-	-	-	-	-	-	1
24AECE22T.2	3	3	1	1	-	-	1	-	-	-	1
24AECE22T.3	2	2	3	3	-	-	1	-	-	-	1
24AECE22T.4	3	3	2	2	-	-	-	-	-	-	1
24AECE22T.5	3	3	2	2	-	-	-	-	-	-	1

Title of the Course: Fundamentals of Electronic Devices and Circuits
Category: ESC
Semester: II Semester
Couse Code: 24AECE21T
Branch/es: EEE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

1. To analyses the transistor biasing circuits.
2. To understand the amplification action of BJT and its h-parameter models.
3. To understand the operation and Characteristics of FET.
4. To analyses the FET biasing circuits.
5. To understand the working principles of special purpose electronic diodes.

Course Outcomes:

At the end of the course, the student will be able to

1. Analyses the transistor biasing circuits.
2. Understand the amplification action of BJT and its h-parameter models.
3. Understand the operation and Characteristics of FET.
4. Analyses the FET biasing circuits.
5. Understand the working principles of special purpose electronic diodes.

Unit 1 Transistor Biasing **9**

Bias Stability - Need for Stabilization – Stabilization Factors (s, s1,s11) – Types of Biasing-Fixed Bias, Collector to Base bias, Emitter-Stabilized bias, Voltage Divider Bias. Simple numerical problems.

Unit 2 Single Stage Amplifiers **9**

Single Stage Transistor Amplifier- Transistor Amplifying Action – Practical circuit of Transistor Amplifier-Classification of Amplifiers- Amplifier equivalent circuit – Concept of h-parameters – Analysis of CE, CB and CC Amplifiers – Comparisons of CE,CB and CC. Simple numerical problems.

Unit 3 Field Effect Transistors **9**

Construction of JFETs – Types – Operation - Characteristics - Construction and Characteristics of MOSFETs–Depletion type MOSFETs–Enhancement type MOSFET.

Unit 4 FET Biasing **9**

FET Biasing: Fixed Bias Configuration–Self Bias Configuration–Voltage Divider Biasing. Simple numerical problems.

Unit 5 Special Purpose Electronic Devices **9**

LED, Tunnel Diode, PIN Diode, SCR, UJT, Photo diode, Photo transistor, Varactor diode, Introduction to wide band gap devices, SiC, GaN and their applications.

Prescribed Textbooks:

3. Electronic Devices and Circuits, David A Bell, Fifth Edition, 2008, Oxford University Press.
4. Electronic Devices and Circuits, J. Millman and Halkias, 1991 edition, 2008,TMH.

Reference Books:

1. Electronic Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, 9th edition,PHI.
2. Principles of Electronics, V. K. Mehta, S. Chand Publications2004
3. Integrated Electronics, Analog and Digital Circuits and Systems, J. Millman and Halkias,TMH.
4. Micro Electronic Circuits, Sedra and Smith, Oxford University Press

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
24AECE21T.1	-	3	2	-	-	-	-	-	-	1	1	3	-
24AECE21T.2	-	3	3	-	1	-	-	-	-	1	1	3	-
24AECE21T.3	-	3	2	-	1	-	-	-	-	2	2	2	3
24AECE21T.4	-	3	2	-	1	-	-	-	-	2	2	2	-
24AECE21T.5	-	3	2	-	1	-	-	-	-	1	1	-	-

Title of the Course: Fundamentals of Electronic Devices and Circuits lab
Category: ESC (LAB)
Semester: II Semester
Couse Code: 24AECE21L
Branch/es: EEE

Lecture Hours	Tutorial Hours	Practice Hours	Credits
0	0	2	1

Course Objectives:

1. To identify the various electrical and electronic components and devices.
2. To analyze the performance of rectifier circuits in practical approach
3. To observe the characteristics of semiconductor devices.
4. To determine parameters like gain, impedances and band width of BJT and FET amplifier circuits.

Course Outcomes:

At the end of the course, the student will be able to
1. Gain the practical knowledge of Diode, BJT, JFET, MOSFET and some special electronic devices.
2. Design the amplifier circuits under given requirements.

List of the Experiments

1. Load regulation and line regulation of Zener Diode.
2. Full Wave bridge rectifier with and without filter.
3. Input and Output Characteristics of Transistor in CE Configuration.
4. Input and Output Characteristics of Transistor in CC Configuration.
5. Characteristics of photodiode and photo transistor.
6. JFET and MOSFET Characteristics.
7. Frequency response of CE Amplifier.
8. Frequency Response of CC Amplifier.
9. Frequency response of Common Source FET Amplifier.
10. SCR Characteristics.
11. UJT Characteristics.
12. Design self-bias circuit.
13. Transistor as a switch.
14. RC coupled Amplifier.
15. Diode clippers

CO-PO Mapping:

Course Outcomes	Engineering Knowledge	Problem Analysis	Design/Development of solutions	Conduct investigations of complex problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project management and finance	Life-long learning	PSO1	PSO2
224AECE21L.1	2	2	2	2	2	-	-	-	-	-	2	2	2

224AECE21L.2	2	2	2	2	2	-	-	-	-	-	2	2	2

ANNEXURE-III

M.TECH COURSE STRUCTURE AND DETAILED SYLLABI

Semester I

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	24BECE11T	Embedded system concepts	3	-	-	3
2	PC	24BECE12T	Modern digital system design	3	-	-	3
3	Program Elective-I	24BECE1AT	MOOCs	3	-	-	3
4	Program Elective-II	24BECE1BT	MOOCs	3	-	-	3
5	MC	24BECE13T	Research methodology and IPR	2	-	-	2
6	AU	24BAUD11T	Disaster Management	-	-	-	-
Lab Courses							
7	PC	24BECE11L	Microcontrollers and interfacing lab	-	-	4	2
8	PC	24BECE12L	Digital system design lab	-	-	4	2
						Total	**18**

Semester II

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	24BECE21T	Embedded software design	3	-	-	3
2	PC	24BECE22T	Internet of things and its applications	3	-	-	3
3	Program Elective-III	24BECE2AT	MOOCs	3	-	-	3
4	Program Elective-IV	24BECE2BT	MOOCs	3	-	-	3
5	AU	24BAUD21T	Academic and Research Report writing	-	-	-	-
Lab Courses							

6	PC	24BECE21L	Advanced Microcontroller Laboratory	-	-	4	2
7	PC	24BECE22L	Internet of things lab	-	-	4	2
8	MC	24BECE21P	Mini Project with Seminar	-	-	2	2
						Total	**18**

Semester III

S. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	
1	Program Elective-V	24BECE3AT	MOOCs	3	-	-	3
2	Open Elective	24BECE3BT	MOOCs	3	-	-	3
3	PW	24BECE31P	Dissertation-I /Industrial Project	10	-	-	10
						Total	**16**

Semester IV

S. No.	**Category**	**Course Code**	**Course Title**	**Hours per week**			**Credits**
				L	**T**	**P**	
1	PW	24BECE41P	Dissertation Phase –II	16	-	-	16
						Total	**16**

Title of the Course Embedded System Concepts
Category PC
Course Code 24BECE11T

Year I M.Tech.
Semester I Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To know the basic difference between embedded system and general systems
- Learn the concepts of different embedded system designs
- Understand the different tools for real time system

Unit 1 AN INTRODUCTION TO EMBEDDED SYSTEMS AND RTOS 14

An Embedded System, Embedded hardware units, Embedded Software in a System, , Embedded System -On-Chip (SOC) and in VLSI Circuit, Classification of Embedded systems, Architecture of kernel, Interrupt Servicing Mechanism, Interprocess Communication and Synchronization of Processes.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of Embedded systems (L2)
- Understand the concept of carriers(L2)

Unit 2 PROCESSOR AND MEMORY ORGANIZATION 12

Structural Units In a Processor, Processor Selection for an Embedded System, Memory Devices, Memory Selection for an Embedded Systems, Allocation of Memory to Program Cache and Memory Management Links, Segments and Blocks and Memory Map of a System, DMA, Interfacing Processors, Memories and Input Output
Devices.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the working principle of processor and its units(L2)
- Analyze the concepts of memory organization.(L4)

Unit 3 DEVICES AND BUSES FOR SOFTWARE ARCHITECTURE 12

CPU bus, networks for embedded systems, Computer Parallel Communication between the Networked I/O Multiple Devices using the ISA, PCI, PCI-X and Advanced Buses, Communication Interfacings: RS 232/UART, RS 422/RS 485, IEEE 488 bus, Software Architectures-Round robin, Round robin with interrupts, Function queue scheduling, RTOS

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the working of devices in software architecture.(L2)
- Learn the different of buses used in software architecture. (L2)

Unit 4 HARDWARE–SOFTWARE CO-DESIGN IN AN EMBEDDED SYSTEM 12

Design methodologies ,Embedded System Project Management, Embedded System Design and Co-Design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, use of Target Systems, use of Software Tools for Development of an Embedded System, use of Scopes and Logic Analysis for System, Hardware Tests. Issues in Embedded System Design.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn various design methodologies used in embedded systems.(L2)
- Analyze the tests and various issues in embedded system design. (L6)

Unit 5 DESIGN EXAMPLES/ Case Studies 8

Automatic chocolate vending machine, Digital camera, Adaptive cruise control in a car, Smart cards

Learning Outcomes: At the end of the unit, the student will be able to:

- Design embedded systems for industrial applications. (L6)
- Design embedded systems for commercial applications. (L6)

Prescribed Text Books:

1. Rajkamal, "Embedded systems: Architecture, Programming and Design" , 2nd Edition, TMH.
2. wayne wolf, "Computers as a component: principles of embedded computing system design", 2nd Edition, Morgan Kaupmann Publishers.

Reference Books:

1. Arnold S Burger," Embedded system design", CMP
2. David Simon, "An embedded software primer ", PEA
3. Steve Heath, Butterworth Heinemann, "Embedded systems design: Real world design", Newton mass USA 2002.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the basic concepts of Embedded systems and RTOS	L2
2. Analyse the functional units of a processor and memory organization	L4
3. Identify various embedded hardware devices and protocol standards.	L1
4. Develop hardware & software for embedded systems by using various design methodologies	L6
5. Design industrial/ real-time/ consumer applications using embedded-system concepts	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE11T.1	3	-	3	2	-	2	3	3
24BECE11T.2	3	-	3	2	-	2	3	3

24BECE11T.3	3	-	2	2	-	1	3	3
24BECE11T.4	3	-	3	1	-	2	3	3
24BECE11T.5	3	-	3	1	-	1	3	3

Title of the Course Modern digital system design
Category PC
Course Code 24BECE12T

Year I M.Tech.
Semester I Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To provide students with a comprehensive understanding of modern digital system design principles and techniques.
- To develop students' skills in designing and analyzing digital logic circuits using hardware description languages.
- To familiarize students with advanced design techniques such as pipelining, parallel processing, and memory hierarchy.
- To introduce students to the concepts of design verification and testing for ensuring the correctness and reliability of digital designs.
- To equip students with the knowledge and skills required for system integration and prototyping of digital systems.

Unit 1 Introduction to Digital Systems 18

Introduction to digital systems and their applications, Basics of binary representation and number systems, Combinational and sequential logic circuits, Boolean algebra and logic gate design, Introduction to hardware description languages (HDL).

Learning Outcomes: At the end of the unit, the student will be able to:

- Apply Boolean algebra and logic gate design techniques to solve complex digital system design problems and optimize logic circuits.
- Gain familiarity with hardware description languages (HDL) such as VHDL or Verilog and effectively utilize them for modeling and simulation of digital systems.

Unit 2 Digital System Components and Subsystems 12

Analysis and design of arithmetic circuits (adders, multipliers), Memory systems and storage technologies, Programmable logic devices (PLDs) and field-programmable gate arrays (FPGAs), Design of control units and finite state machines.

Learning Outcomes: At the end of the unit, the student will be able to:

- Analyze and design arithmetic circuits, including adders and multipliers, demonstrating the ability to perform accurate arithmetic operations in digital systems.
- Apply critical thinking and problem-solving skills to address challenges in the analysis and design of arithmetic circuits, memory systems, programmable logic devices, control units, and finite state machines.

Unit 3 Advanced Digital Design Techniques 12

Timing analysis and synchronization techniques, Pipeline and parallel processing architectures, Memory hierarchy and cache design, Design and analysis of digital filters, Introduction to hardware/software co-design.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand and apply timing analysis and synchronization techniques to ensure proper timing and synchronization of digital systems, mitigating issues such as clock skew and metastability.
- Apply critical thinking and problem-solving skills to address challenges in timing analysis, pipeline design, memory hierarchy, digital filter design, and hardware/software co-design.

Unit 4 Design Verification and Testing 15

Principles of design verification and testing, Testability and fault models, Simulation and verification techniques, Built-in self-test (BIST) and boundary scan, Design for testability (DFT) techniques.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the principles of design verification and testing in digital systems, including the importance of ensuring the correctness and reliability of designs through rigorous testing methodologies.
- Apply testability and fault models to identify potential faults and design test cases for detecting and diagnosing faults in digital systems.

Unit 5 System Integration and Prototyping 15

Integration of digital subsystems into larger systems, System-level design considerations, Prototyping methodologies and tools, High-level synthesis and hardware/software co-design.

Learning Outcomes: At the end of the unit, the student will be able to:

- Gain the ability to integrate digital subsystems into larger systems, considering factors such as interconnectivity, compatibility, and functionality, to create complex and cohesive digital systems.
- Understand system-level design considerations, including performance optimization, power efficiency, and reliability, to make informed decisions during the integration process.

Prescribed Text Books:

1. "Digital Design and Computer Architecture" by David Harris and Sarah Harris.
2. "Digital Systems: Principles and Applications" by Ronald J. Tocci, Neal S. Widmer, and Gregory L. Moss.
3. "Digital Design: With an Introduction to the Verilog HDL" by M. Morris Mano and Michael D. Ciletti.

Reference Books:

1. "Introduction to Digital Systems: Modeling, Synthesis, and Simulation Using VHDL" by Mohammed Ferdjallah.
2. "Modern Digital Electronics" by R.P. Jain.

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Analyze and design basic combinational and sequential logic circuits.	L4
2. Apply hardware description languages (HDLs) for modeling and simulation of digital systems.	L3
3. Analyze and optimize the timing performance of digital designs.	L3
4. Apply design verification and testing techniques for ensuring the correctness of digital designs.	L4

5. Integrate digital subsystems into larger systems and prototype them using FPGAs and development boards. L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE12T.1	3	3	3	3	3	-	2	3
24BECE12T.2	3	2	3	2	2	-	3	3
24BECE12T.3	3	2	3	2	2	-	2	3
24BECE12T.4	3	3	3	2	2	-	2	3
24BECE12T.5	3	2	3	2	2	-	2	3

Title of the Course Micro controllers and interfacing lab
Category PC
Couse Code 3ECE11L

Year I M.Tech.
Semester I Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To provide basics of processors and programming skills in the assembly level
- To provide strong foundation on interfacing of external devices to the processor to solve real time problems.

List of Experiments

ASSEMBLY / C PROGRAMING:

***All the below experiments should use 8051 Microcontroller Kit.**

1. Addition of two 16 bit numbers.
2. Copy contents of R0, R1, R2 of bank 0 to R5, R6, R7 of bank 3 using stack.
3. Generate a pulse of specified duration at a port pin using Timer0/1
4. A Door Sensor is connected to P1.1 Pin and a Buzzer is connected to P0.7. Write a Program to monitor Door Sensor and when it Open, Sounds the Buzzer by sending a Square Wave to it.
5. Write a Program to Toggle all the Bits of PORT 2 continuously with a 250ms Delay.
6. Switch and LED Interface.
7. Seven Segment Display Interfacing.
8. LCD Interfacing.
9. Key Pad Interfacing.
10. Serial Communication.
11. Analog input Interfacing.
12. Sort RTOS on to 89C51 board.

Course Outcomes:

Students will be able to — Blooms Level of Learning

1. Understand the fundamentals of microcontrollers and systems and operations through simulation.	L1
2. Understand the interfacing concepts on various devices practically.	L2
3. Acquire knowledge of the Keil concepts.	L2 & L3
4. Apply the knowledge of RTOS and on-board peripheral theories with the help of Laboratory simulations.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE11L.1	3	1	-	2	-	-	3	3
24BECE11L.2	2	-	3	-	1	-	3	1
24BECE11L.3	1	2	-	3	-	3	2	-
24BECE11L.4	2	3	1	-	1	-	1	1

Title of the Course Digital system design lab
Category PL
Couse Code 24BECE12L
Year I M.Tech.
Semester I Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To provide students with hands-on experience in designing and implementing basic digital logic circuits.
- To enhance students' understanding of combinational and sequential logic circuits through practical experiments.
- To develop students' skills in using hardware components and tools for constructing and testing digital circuits.
- To strengthen students' grasp of digital design concepts such as logic gates, adders, encoders, decoders, flip-flops, counters, and shift registers.
- To enable students to analyze and verify the behavior of digital circuits through experimental testing.

List of Experiments

Simulte the following designs using VHDL and Verilog for their IC configurations.

1. Design and implementation of Basic Digital Logic Gates.
2. Design and implementation of Half Adder, Full Adder, Ripple Carry Adder.
3. Design and implementation of Half Subtractor, Full Subtractor.
4. Design and implementation of various Encoders
5. Design and implementation of various Decoders
6. Design and implementation of various Multiplexers.
7. Design and implementation of different Demultiplexers.
8. Design and implementation of Flip Flops (JK,D, T).
9. Design and implementation of Ones Counter.
10. Design and implementation of Left Shift and Right Shift Registers.
11. Design and implementation of Barrel Shift Register.
12. Design and implementation of ALU.

Course Outcomes:

Student will be able to — Blooms Level of Learning

1. Design, implement, and verify the functionality of basic digital logic gates.	L4
2. Apply Boolean algebra and truth tables to analyze and construct combinational logic circuits.	L4
3. Apply Boolean algebra and truth tables to analyze and construct sequential logic circuits.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE12L.1	3	2	3	2	2	-	3	3
24BECE12L.2	2	2	3	2	2	-	3	3
24BECE12L.3	2	2	3	3	2	-	3	3
24BECE12L.4	2	3	2	2	2	-	3	3

Title of the Course Embedded Software Design
Category PC
Course Code 24BECE21T

Year I M.Tech.
Semester II Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand and analyze the design of an Embedded System.
- To write Embedded Software.

Unit 1 Introduction to Embedded Systems 8

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the basic concepts of Embedded Systems (L2)
- Know the application areas and purpose of Embedded Systems in today's environment (L1)

Unit 2 Embedded System Design Life Cycle 15

Embedded design life cycle: Introduction, Product specification, Hardware/Software partitioning, Iteration and implementation, Detailed hardware and software design, Hardware/Software integration, Product testing and release, Maintaining and upgrading existing products. Selection Process: packing the silicon, Adequate performance, RTOS availability, Tool change availability, Other issues in the selection process, Partitioning decision: Hardware/Software duality, Hardware trends, ASIIC's and Revision Costs.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the design life cycle of Embedded System (L2)
- Understand the various factors involving in Embedded Systems (L2)

Unit 3 Development Environment 10

The execution environment, Memory organization, System startup. Special software techniques: Manipulating the Hardware, Interrupt and Interrupt service routines (ISR's), Watch dog timer, Flash memory, design methodology. Basic tool set: Host-Based debugging, remote debuggers and debug kernels, ROM emulator, Logic analyzer.

Learning Outcomes: At the end of the unit, the student will be able to :

- Understand the development environment of Embedded System (L2)
- Learn the various features in Embedded Systems (L2)

Unit 4 Debugging & Testing
12

BDM: Background debug mode, Joint extraction group (JTAG) and Nexus.
ICE- Integrated solution: Bullet proof run control, Real time trac, Hardware Break points, Overlay memory, Timing constraints, usage issue, setting the trigger.
Testing: Why Test? When to Test? Which Test? When to stop? Choosing test cases, testing embedded software, Performance testing maintenance and testing, the future.

Learning Outcomes: At the end of the unit, the student will be able to:

- Learn the debugging features of Embedded System (L2)
- Understand the importance of testing an Embedded Application (L2)

Unit 5 Embedded Software 13

Writing software for Embedded systems: The compilation process, Native versus Cross- Compliers, Run Time libraries, Writing a Library, Using Alternative libraries, Using a standard Library, Porting kernels, C extensions for embedded systems, Downloading . Emulation and debugging techniques; Buffering and other data structures: What is a buffer? Linear buffers, Direction buffers, double buffering, Buffer exchange, Linked lists, FIFOS, circular buffers, Buffer under run and overrun, Allocating buffer memory, Memory leakage, Memory and performance Trade-offs.

Learning Outcomes: At the end of the unit, the student will be able to:

- Write software for Embedded Systems (L6)
- Learn the concepts related to memory allocation in Embedded Systems (L2)

Prescribed Text Books:

1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill
2. Embedded system design- Introduction to processes, tools, Techniques, Arnold S Burger,CMP
3. Embedded system design by Steve Heath, Newnes

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Understand the basic concepts of Embedded Systems	L2
2. Learn the design concepts of an Embedded Systems	L2
3. Understand the development stages in designing Embedded Application	L2
4. Learn the debugging & Testing of an Embedded Application	L2
5. Write Embedded Software	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE21T.1	2	2	2	1	1	1	1	-
24BECE21T.2	1	2	2	3	2	2	1	-
24BECE21T.3	2	2	3	3	2	2	2	3
24BECE21T.4	1	1	2	3	1	2	2	2
24BECE21T.5	1	3	2	3	2	3	3	3

Title of the Course Internet of things and its applications
Category PC
Course Code 24BECE22T

Year I M.Tech.
Semester II Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practice Hours	Credits
3	0	0	3

Course Objectives:

- To understand the new paradigm of objects interacting with people, information systems and with other objects
- To introduce various IoT protocols.
- To understand the issues in developing specific real time systems on various IoT platforms.

Unit 1 Introduction to Internet of Things 8

Definition and Characteristics of IoT, Physical Design of IoT – IoT Architecture, Smart Objects, Bits and Atoms, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of IOT architecture, different technologies of IOT (L2)
- Understand the concept communication protocols (L2).

Unit 2 IoT Standards and Protocols 10

Infrastructure (ex: 6LowPAN, IPv4/IPv6, RPL); Identification (ex: EPC, uCode, IPv6, URIs); Comms / Transport (ex: Wifi, Bluetooth, LoRa); Discovery (ex: Physical Web, mDNS, DNS-SD); Data Protocols (ex: MQTT, CoAP, AMQP, WebSocket, Node); Device Management (ex: TR-069, OMA-DM); Semantic (ex: JSON-LD, Web Thing Model); Multi-layer Frameworks (ex: Alljoyn, IoTivity, Weave, HomeKit).

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of Infrastructure on different IOT standards L2)
- Design and analysis of different IOT protocols (L4, L6)

Unit 3 Introduction to Python 10

Features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand the concept of 3D Printing (L2)

Unit 4 IoT Physical Devices and Endpoints 10

Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, and reading input from pins.

Learning Outcomes: At the end of the unit, the student will be able to:

- Understand and analyze the electronic system (L4)

Unit 5 IoT Platforms and Applications **11**

Introduction to IoT Platforms (AWS IoT, IBM Watson, ARM Mbed), Cloud Storage models and communication APIs, Python web application framework Designing a RESTful web API.

IoT Applications and issues, Combination scenarios, Breaking assumptions: - Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle with Case Studies

Learning Outcomes: At the end of the unit, the student will be able to:

- Design and analyze the concepts of IOT Applications (L5)

TEXT BOOKS:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers, 2007

REFERENCES:

1. Adrian Mcewen, HakinCassimally Designing the Internet of Things Paperback – 25 Jul 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi, and The Internet of Things: Key Applications and Protocols Hardcover – Import, 6 Jan 2012.
3. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759
4. Keoh, SyeLoong, SahooSubhendu Kumar, and Hannes Tschofenig. "Securing the internet of things: A standardization perspective." Internet of Things Journal, IEEE 1.3 (2014): 265-275

Course Outcomes:

At the end of the course, the student will be able to Blooms Level of Learning

1. To understand the new paradigm of objects interacting with people, information systems and with other objects — L2
2. To introduce various IOT protocols — L3
3. To understand the issues in developing specific real time systems on various IOT platforms — L2
4. Understand and analyze the electronic systems. — L4
5. Design and analyze the concepts of IOT Applications — L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE22T.1	-	2	2	2	3	1	2	3
24BECE22T.2	-	2	3	2	2	-	3	-
24BECE22T.3	-	2	3	2	2	1	2	3
24BECE22T.4	3	3	3	2	2	1	2	3
24BECE22T.5	3	2	3	-	-	-	2	3

Title of the Course Advanced Microcontrollers Lab
Category PC
Couse Code 3ECE21L
Year I M.Tech.
Semester II Semester
Branch Embedded Systems

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives:

- To provide strong foundation on interfacing of external devices to the processor to solve real time problems.
- To benefit the students with the basic knowledge for life-long learning needed for successful professional carrier.

List of Experiments

*All the below experiments should use Advanced RISC Machine(32-bit)

1. 12-bit ADC
2. Elevator control
3. Keypad Interfacing
4. Logic controller
5. Stepper motor interfacing
6. Traffic light interfacing

7. Relay Programming
8. Model Train/RTOS implementation
9. Temperature Transducer
10. Graphical LCD

Course Outcomes:

Student will be able to	Blooms Level of Learning
4. Design application circuits using advanced microcontrollers.	L3
5. Gain knowledge of applying the concepts to obtain the solutions for real time problems	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE21L.1	3	2	1	3	3	3	3	3
24BECE21L.2	2	2	1	1	1	2	3	2

Title of the Course Internet Of Things Lab
Category PC
Couse Code 24BECE22L

Year I M.Tech.
Semester II Semester
Branch Embedded Systems

Course Objectives:

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	2

1. To understand the terminology, technology and its applications of IoT.
2. To memorize the software platforms which are used for developing the applications.
3. To learn the concepts of python programming language which was used to develop the IoT projects.
4. To learn the concepts of Arduino IDE which is used to develop the IoT projects in Arduino Kits.
5. To know the hardware platforms which is necessary to develop the IoT applications?

List of Experiments

1. Start Raspberry Pi, and try Various Linix Commands in Command Terminal Windows :

(is,cd,touch,mv,nm,man,mkdir,tar,gzip,cat,more,less,ps,sido,cron,chown,chgrp,ping etc)

2. Run some Python Programs On Pi like
   - Read your Name and Print Hello Message With name read two numbers , and Print their Sum ,difference ,Product and Division .
   - Word and character count of a given String
   - Area of a given Shape (rectangles , Triangle and Circle) Reading Shape and appreciate Values from Standard input
   - Print a name “n” Times where name and n are read from standard input , using for and While loops .
3. Light an LED Through Python Programs.
4. Flash an LED at a Given on Time And OFF Time Cycle, where the Two Times are Taken From a File.
5. Access an Image through a Pi Web Cam
6. Detect the motion of an object using the PIR sensor.
7. Blinking a multiple LED’s Blink using ARDUINO IDE.
8. Controlling the traffic light signals using ARDUINO IDE.
9. Calculate the distance of an object with the help of Ultrasonic Sensor in ARDUINO IDE.
10. Detect the Moisture of an Soil using Soil Moisture sensor in Arduino IDE.
11. Controlling the Led blink using Switch.
12. Measure the Temperature and humidity using DHT11 Sensor.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2
24BECE22L.1	3	1	-	2	-	2	3	3
24BECE22L.2	2	-	3	-	1	2	3	1
24BECE22L.3	1	2	-	3	-	1	2	-
24BECE22L.4	2	3	1	-	1	-	1	1
24BECE22L.5	1	1	-		1	1	1	-

ANNEXURE-IV

INDUSTRY RELAVENT COURSES

S.No.	Course Title	Semester	Credits
1	Communication Systems	IV	3
2	VLSI Design	V	3
3	Deep Learning	V	3
4	Foundations of Artificial Intelligence and Data Science	V	3
5	Machine Learning	V	3
6	IoT Lab	V	1.5
7	IoT Based Embedded System design	VII	2

ANNEXURE-V

RESEARCH ADMISSION TEST-2024 (AURAT) SYLLABUS

UNIT-I: NETWORKS, SIGNALS & SYSTEMS

Circuit analysis: Node and mesh analysis, superposition, Thevenin's theorem, Norton's theorem, reciprocity. Sinusoidal steady state analysis: phasors, complex power, maximum power transfer. Time and frequency domain analysis of linear circuits: RL, RC and RLC circuits, solution of network equations using Laplace transform., Linear 2-port network parameters, wye-delta transformation.

Continuous-time signals: Fourier series and Fourier transform, sampling theorem and applications.

Discrete-time signals: DTFT, DFT, z-transform, discrete-time processing of continuous-time signals. LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response, group delay, phase delay.

UNIT-II: ANALOG ELECTRONICS

Semiconductors: Energy bands in intrinsic and extrinsic semiconductors, equilibrium carrier concentration, direct and indirect band-gap semiconductors.

Carrier transport: diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, Poisson and continuity equations.

Basics of Electronic Devices: P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED,

photo diode and solar cell.

Diode circuits: clipping, clamping and rectifiers.

BJT and MOSFET amplifiers: biasing, ac coupling, small signal analysis, frequency response.

Op-amp circuits: Amplifiers, summers, differentiators, integrators, active filters, Schmitt triggers and oscillators.

UNIT-III: DIGITAL ELECTRONICS

Number representations: binary, integer and floating-point- numbers.

Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, multiplexers, decoders.

Sequential circuits: latches and flip-flops, counters, shift-registers, finite state machines,

Semiconductor memories: ROM, SRAM, DRAM.

Introduction of Microprocessor 8086: Architecture, Addressing modes, instruction set, interrupts, Programming, Memory and I/O interfacing.

Introduction of Microcontrollers – 8051 for embedded systems, Architecture and register set of Microcontroller 8051, Addressing modes, Instruction set of 8051 – Data transfer instructions, Arithmetic instructions, Logic instructions, bit level and byte level control transfer instructions, 8051 assembly programming – stack operations, subroutines, interrupts, 8051 programming as timer/counter, 8051 serial communication.

UNIT-IV: COMMUNICATIONS

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers.

Information theory: entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, Fundamentals of error correction, Hamming codes.

Optical communication: Optical sources - LED, spontaneous and stimulated emission, semiconductor Lasers, Detectors – PIN photodiodes, Avalanche photodiodes (APD), Optical fibers – attenuation and dispersion characteristics.

UNIT-V: ELECTROMAGNETICS

Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth.

Transmission lines: equations, characteristic impedance, impedance matching, impedance

transformation, S-parameters, Smith chart.

Wave guides: Rectangular and circular wave guides,

Antennas: Antenna Parameters, principles, Dipole and monopole antennas, linear antenna arrays.

ANNEXURE-VI

LIST OF CORE SUBJECTS FOR RESEARCH WORK

S.No	Subject-1	Subject-2
1.	Image & VideoProcessing	Image Processing and Computer Vision
2.	SpeechProcessing	Digital Video Processing
3.	Bio-medical signal Processing	Biomedical Imaging Systems
4.	Digital Signal Processors and Architectures	Advanced Digital Signal processing
5.	Embedded Real Time Operating Systems	Real Time Concepts for Embedded Systems
6.	Advanced Embedded Processor Architecture	Embedded Networking
7.	Robotics	Micro Electro-mechanical Systems
8.	Instrumentation and Embedded Systems	Microcontrollers for Embedded system Design
9.	Digital System Design	Digital IC Design
10.	VLSI Technology and Design	Algorithms for VLSI Design Automation
11.	CMOS Analog & Mixed Signal Design	Low Power VLSI Circuits
12.	CPLD & FPGA Architectures and Applications	Micro Electronics
13.	Advanced Data Communications	Telecommunication Switching & Networks
14.	Satellite Communications	Wireless Communications&Networks
15.	Antenna Measurements	Microwave Antennas
16.	Radar Engineering	Global Positioning Systems

Subject-3: Research Methodology
Subject-4: Research and Publication Ethics

ANNAMACHARYA UNIVERSITY

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(ESTD, UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)

Rajampet, Annamayya District, A.P – 516126, INDIA

ANNEXURE-VII

LIST OF EXAMINERS

S.No	Subject Title & Code	Subject Expert Name	Designation	Address
1	Embedded system concepts	Dr R S Ernest Ravindran	Asst.Prof	KLU,Vijayawada
2		G Sudheer Kumar	Asso.Prof	GPREC,Kurnool
3		Dr K Harikishore	Professor	KLU,Vijayawada
4		Dr P.Janardhana Sai	Associate Professor	Adisankara, Gudur
5		Dr.S.Chandra Mohan reddy	Assistant Professor,	JNTUCEP,Pulivendula
S.No	**Subject Title & Code**	**Subject Expert Name**	**Designation**	**Address**
1	Modern digital system design	Dr K Sudhakar	Professor	St. John's College of Engg. & Tech., Yemmiganur
2		Dr.S. Venkata Kiran	Associate Professor	Dept of E.C.E, SVPCET, Puttur.
3		Dr K Sudhakar	Professor	St. John's College of Engg. & Tech., Yemmiganur
4		Dr N Sreekanth	Professor	MECW,Hyderabad
5		Dr.K.V.Ramanaiah	Professor	Dept. of ECE, YSR Engg College, Proddutur
S.No	**Subject Title & Code**	**Subject Expert Name**	**Designation**	**Address**
1.	Embedded software design	Dr.S. Venkata Kiran	Associate Professor	Dept of E.C.E, SVPCET, Puttur.
2.		Dr.M.Chennakesav	Associate Professor	Dept of E.C.E, RGMCET,Nandayal
3.		Dr.P.Amzad Khan	Associate Professor	Dept of E.C.E, GPREC,Kurnool
4.		Dr.K.Sudheer Babu	Associate Professor	Dept of E.C.E, GPREC,Kurnool
5.		Dr.VNV.Satya Prakash	Associate Professor	Dept of E.C.E, RGMCET,Nandayal

S.No	Subject Title & Code	Subject Expert Name	Designation	Address

1.	**Internet of things and its applications**	Dr.D. Vishnu Vardhan	Professor	Dept of E.C.E, JNTUACE, Ananathapuramu
2.		Dr.T.Lakshmi Narayana	HOD & Associate Professor	Dept of E.C.E, KLMCE,Kadapa
3.		Dr.K.Mahesh Babu	Associate Professor	Dept of E.C.E, SVCE, Tirupathi
4.		Dr.S.Naga Jyothi	Associate Professor	Dept of E.C.E, MITS, Madanapalli
5.		Dr.P.Shamsheer Khan	Associate Professor	Dept of E.C.E, GPRCE, Kurnool
S.No	**Subject Title & Code**	**Subject Expert Name**	**Designation**	**Address**
1	**Fundamentals of Electronic Devices and Circuits**	Dr D Suresh	Professor	RNSIT,Bengaluru
2		Dr.K. Murali	Professor	Dept. of ECE, NEC, Nellore
3		Dr S Mahaboob Basha	Professor	GIT,Nellore
4		Dr S. Shafiulla Basha	Assistant Professor	Dept. of ECE, YVU, Proddatur
5		Dr.M.V.Subramanyam	Professor	Shantiram Engg College, Nandyal
1	**Electronic Devices and Circuits**	Dr. B. Saroja	Professor	Dept of ECE, SIETK, Puttut
2		Dr S Mahaboob Basha	Professor	GIT,Nellore
3		Dr B Polaiah	Professor	KLU,Vijayawada
4		Dr.P.Santhosh Kumar	Assistant Professor	Dept of E.C.E, Y.V University, Proddatur.
5		Dr.S.Zahiruddin	Associate Professor	Dept. of E.C.E, KSRM, Kadapa