JSS MAHAVIDYAPEETHA
JSS SCIENCE AND TECHNOLOGY UNIVERSITY
SRI JAYACHAMARAJENDRA COLLEGE OF ENGINEERING
• Constituent College of JSS Science and Technology University
• Approved by A.I.C.T.E
• Governed by the Grant-in-Aid Rules of Government of Karnataka
• Identified as lead institution for World Bank Assistance under TEQIP Scheme

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Hardware Systems Integration and Simulation Lab (20EC38L)

Lab Location :CS201

Prepared by:
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Vision statement of JSS Science and Technology University

- **Advancing JSS S&T University as a leader in education, research and technology on the International arena.**
- **To provide the students a universal platform to launch their careers, vesting the industry and research community with skilled and professional workforce.**
- **Accomplishing JSS S&T University as an epicenter for innovation, center of excellence for research with state of the art lab facilities.**
- **Fostering an erudite, professional forum for researchers and industrialist to coexist and to work cohesively for the growth and development of science and technology for betterment of society.**

Mission statement of JSS Science and Technology University

1. **Education, research and social outreach are the core doctrines of JSS S&T University that are responsible for accomplishment of in-depth knowledge base, professional skill and innovative technologies required to improve the socio economic conditions of the country.**
2. **Our mission is to develop JSS S&T University as a global destination for cohesive learning of engineering, science and management which are strongly supported with interdisciplinary research and academia.**
3. **JSS S&T University is committed to provide world class amenities, infrastructural and technical support to the students, staff, researchers and industrial partners to promote and protect innovations and technologies through patents and to enrich entrepreneurial endeavors.**
4. **JSS S&T University core mission is to create knowledge led economy through appropriate technologies, and to resolve societal problems by educational empowerment and ethics**

Vision statement of the department of E&CE

Be a leader in providing globally acceptable education in electronics and communication engineering with emphasis on fundamentals-to-applications, creative-thinking, research and career- building.

Mission statement of the department of E&CE

1. **To provide best infrastructure and up-to-date curriculum with a conducive learning environment.**
2. **To enable students to keep pace with emerging trends in Electronics and Communication Engineering.**
3. **To establish strong industry participation and encourage student entrepreneurship.**
4. **To promote socially relevant eco-friendly technologies and inculcate inclusive innovation activities.**

Program Outcomes (POs)

1. **Engineering Knowledge**: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences

3. **Design/ Development of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
4. **Conduct investigations of complex problems**: Using research based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6. **The Engineer and Society**: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.
11. **Lifelong Learning**: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

12. **Project Management and Finance**: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Program Specific Outcomes (PSOs)

1. Analyze, design and provide engineering solutions in the areas of electronic circuits and systems.
2. Demonstrate the mathematical modeling techniques, nurture analytical and computational skills to provide engineering solutions in the areas of electronics and communication.
3. Ability to address multidisciplinary research challenges and nurture entrepreneurship

Program Educational Objectives (PEOs)

1. To enable the graduates to have strong Engineering fundamentals in Electronics & Communication, with adequate orientation to mathematics and basic sciences.
2. To empower graduates to formulate, analyze, design and provide innovative solutions in Electronics & Communication, for real life problems.
3. To ensure that graduates have adequate exposure to research and emerging technologies through industry interaction and to inculcate professional and ethical values.
4. To nurture required skill sets to enable graduates to pursue successful professional career in industry, higher education, competitive exams and entrepreneurship.

20EC38L Hardware Systems Integration and Simulation Lab

Course Outcomes:

Course Outcomes: After completing this course, students should be able to:

CO1	CO1	Analyze hardware and software sub-systems and configure them for running the simulation.
	CO2	Analyze and run commands at various levels (user, admin, network and security), develop programs to verify various mathematical operations using Octave/Matlab/Python/C++ and simulate simple circuits using tools available in TINA/ p-spice/eSim.
	CO3	Demonstrate basic skills required for Printed Circuit Board (PCB) design and development.

List of Experiments :

Sl.no	sub-section	Experiments	Cos covered and marks allotted	Remarks
1	Part-A	IIntroduction to PC Hardware and sub - systems standards and technologies.	1,2	
2		PC Interfaces (wired and Wireless) a and Networking fundamentals	1,2	
3		Introduction to Software installation on PC and Booting process . Creating Mono boot /Dual boot/ Virtual systems (Windows/Linux installation process)	1,2	
4		Terminal usage, Commands practice program execuation under Linux envirnoment	1,2	
5	Part-B	Matrix operations	1,2	
6		String operations, Graphical plots	1,2	
7		Verification of DC, AC circuits	1,2	
8		Verification of Transistor circuits	1,2	
9		PCB Design practice using open	3	

	PART-C	tools		
10		PCB fabrication and Soldering	3	

Introduction to HSIS LAB(20EC38L) and its facilities :

Equipment and facilities :

1. Computer with Internet connection
2. Tool box
3. PC Demonstrator setup with all subsystems

Experiment :1

Objectives :

To conduct a survey of PC hardware subsystems of various manufacturers and technology used

Components/Hardware used:

Mother board, RAM, Power supply, Peripheral devices

Method/Procedure :

i) To open a PC system.

ii) Identify various subsystems on the mother board - Graphics card, Network Interface Card, Power supply

iii) Mount /Unmount Processor and Fan Assembly.

iv) Mount /Unmount RAM, in their slot

v) Mount /Unmount Hard disk from the slots - IDE slots,

SCSI slots

Theory/Make/Model/Technical Specifications :

Sl.no.	Device name	Make/Model	Technical specifications	Vendors/ Manufacturers

Theory:

Inference :

(for example , after the conduction of the lab I have made a visual inspection of components/subsystems tried connecting various cables, placed processor on the slots, RAM slots , CMOS battery, power sockets SMPS and various other connectors**)**

References :

1.https://computergarage.org/

2. https://www.intel.in/

3.https://www.geeksforgeeks.org/peripherals-devices-in-computer-organization/

Experiment : 2

Objectives : To study external and Internal Interfaces of a PC

Components/Hardware used: PC Mother board, External Interface cards

Method/Procedure :

i) To open a PC system.

ii) Identify various Interfaces on the mother board

iii) Internal Interfaces : IDE drives, SCSI Interfaces, SATA Inteface ,PCI Interfaces

iv) External Intefaces : RS232, HDMI, USB1.0/2.0/3.0

Theory/Make/Model/Technical Specifications :

Sl.no.	Device name	Make/Model	Technical specifications	Vendors/ Manufacturers

Theory:

1) Internal Interfaces (Serial , parallel and predominantly wired)

2)External Interfaces (Serial, Parallel and both wired and wireless)

Inference :

References :

https://www.pctechguide.com/interfaces/io-interface-standard

Experiment : 3

Aim/Objectives :

To install software on PC,

Analyse PC booting Process,

Performing disk partition and formatting,

Creating Monoboot/Dual boot/Virtualisation under Windows and Linux Envirnoment

Components/Hardware used:

PCs and Laptops

Method/Procedure :

i) To connect Hard disk on the PC, and verify its Interfaces

ii) Ensure Empty Hard disk and Format

iii) Perform Partition on the Hard Disk and create partitions

iv) Load the OS

Theory/Make/Model/Technical Specifications of Hard Disk(Magnetic/optical/SSD)

Sl.no.	Device name	Make/Model	Technical specifications	Vendors/ Manufacturers

Theory and Diagram :

Inference :

References :

1) https://www.pctechguide.com/interfaces/io-interface-standards

2) Upgrading and Repairing PCs by Scott Mueller. Que Publishing, 2015.

3) https://www.explainthatstuff.com/harddrive.html

Experiment : 4 **Command usage practice**

Aim/Objectives :

Terminal usage,
Commands practice
Program execuation under Linux envirnome

Components/Hardware used:

PCs and Laptops with installed OS windows and Linux (Dual Boot systems)

Method/Procedure :

i) Boot -up the PC, to either windows/Linux

ii) open the terminal

iii) use CLI (command line Interface) to interact with the OS

iv) write programms using any editor and save and execute them using commands

v) practice more commands at user/admin/network levels

Theory and Diagram :

1) command Line Interfaces (CLI)

2)Graphical User Interfaces (GUI)

3)Unix/Linus Shell Interfaces

4)Linker,Debugger, Libraries,API

5) C- Preprocessing envirnoment

Inference :

References :

1) https://ubuntu.com/tutorials/command-line-for-beginners

2) https://www.tutorialspoint.com/unix/index.htm

3) https://www.linuxfoundation.org/

PART-B:(Emphasis to use Octave/Python software tools)

Experiment 5:

Compute and verify various mathematical operations, Matrix operations

Experiment 6 :

Compute and verify string operations, number system conversion and graphical plot commands.

Experiment 7 :

Simulate and verify branch currents and voltages in DC circuits

Simulate and verify branch currents and voltages in AC circuits

Experiment 8:

Simulate and verify branch currents and voltages in transistor circuits

PART-C: PCB Design Skills

Experiment 9

Design simple circuits using CAD Tools (Eagle CAD student version)

Experiment 10:

Etching Process in the Lab

Soldering and Testing process (open/short circuit, continuity etc.)