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Department of Electrical and Electronics Engineering

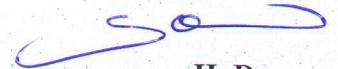
1.3.2. Average percentage of courses that include experiential learning through project work / field work / internship during AY2023-24

S.No	Title of IV yr Project	Subject code & Subjects name related to the Projects
1	Image Processing based fire detection using ESP - 8266 with AI	EE8691 - Embedded Systems
2	Public Washroom Automation	EE8551 - Microprocessors and Microcontrollers
3	LPG Gas leakage detection and safety control system	IC8451 - Control Systems
4	AI thermometer using Arduino	EI8073 - Biomedical Instrumentation
5	IOT health sentinel remote monitoring for timely care	EE8702 - Power system operation and control
6	IOT based energy conservation using NODEMCU	EE8703 - Renewable energy systems



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HoD

**IMAGE PROCESSING BASED FIRE DETECTION USING ESP-8266 WITH
AI**

A PROJECT REPORT

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*In partial fulfillment for the award of the
degreeOf*

BACHELOR OF ENGINEERING

IN

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS
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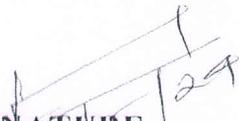


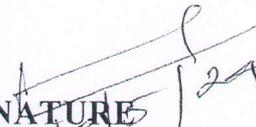
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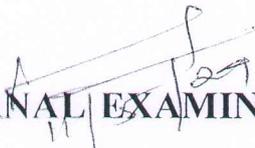
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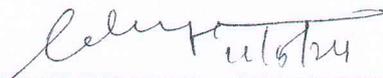
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ABSTRACT

This work explores the potential of Image Processing for fire detection systems utilizing the ESP8266 microcontroller. The ESP8266's low cost and Wi-Fi capabilities make it attractive for developing Internet of Things (IoT) fire alarms. The paper reviews existing research on image processing techniques for fire detection with ESP8266, including color segmentation, motion analysis, and even exploring limitations of deploying machine learning directly on the device.

Challenges such as processing power, real-time performance, and false alarms are discussed. Finally, the future directions of this field are explored, highlighting potential solutions like hybrid systems with more powerful processors or cloud-based processing for complex algorithms. Overall, this work suggests that image processing with ESP8266 is a promising and evolving approach. This abstract explores the concept of employing an ESP8266 microcontroller for image-based fire detection with the incorporation of artificial intelligence (AI).

Traditional fire alarms often rely on heat or smoke sensors, which might have limitations in specific scenarios. This approach leverages image processing techniques on the ESP8266 to analyze visual data captured by a camera. By integrating AI, particularly pre-trained models or machine learning algorithms, the system can potentially achieve more accurate and intelligent fire detection.

The abstract would delve into the advantages of this method, such as real-time fire recognition and reduced false alarms. However, challenges related to the ESP8266's computational limitations and the complexity of implementing AI models on this platform would also be discussed. Overall, the abstract presents a promising direction for developing a lightweight and intelligent fire detection system using the ESP8266 and image processing with AI.



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CHAPTER 7

CONCLUSION

The processing and AI-based fire detection with ESP8266 presents a unique balance between early fire identification and resource efficiency. By combining the ESP8266's image processing capabilities with AI-powered analysis, this system offers a promising approach for enhancing fire safety in various settings.

Strengths:

Early Warning Potential: Real-time image analysis allows for potentially faster fire detection compared to traditional methods, providing a crucial head start for response and evacuation.

Resource Optimization: By focusing on feature extraction and leveraging the cloud or a separate device for AI processing, the system operates efficiently on the resource-limited ESP8266.

Considerations for Implementation:

Resource Constraints: Careful planning and optimization of algorithms, model selection, and memory usage are essential to ensure smooth operation on the ESP8266.

AI Model Training: Creating a robust AI model necessitates expertise in machine learning and a diverse dataset encompassing various fire scenarios and lighting conditions.

Minimizing False Alarms: Filtering techniques and AI training data need to be carefully designed to minimize false alarms triggered by sunlight, reflections, or other non-fire sources.

Cloud vs. Local Processing: While cloud-based processing offers scalability, the trade-off is potential latency. Consider local processing options for faster response times in critical situations.

Future Directions:



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PUBLIC WASHROOM AUTOMATION

A PROJECT REPORT

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ABSTRACT

This paper addresses the pervasive issue of inadequate public sanitation in various regions of India and slums, marked by rampant urination and poorly maintained public toilets. Despite significant governmental expenditure and efforts to maintain cleanliness, the absence of a centralized monitoring mechanism renders these endeavors ineffective.

To overcome this challenge, the paper proposes an Internet of Things (IOT)-based toilet monitoring system utilizing a web server and a mobile cleaner application. The system aims to simplify monitoring processes for toilet cleaners and administrators by tracking multiple cleaning metrics and providing real-time alerts based on user input.

The motivation behind this project stems from the alarming state of hygiene in government schools, where students or teachers often bear the responsibility of cleaning due to labor shortages and insufficient funds. The relevance of the proposed system lies in its potential to revolutionize the maintenance of school and public toilets, addressing the unhygienic conditions prevalent in India.

The novelty of the system includes features like automatic water flush, UV sanitization, timely floor cleaning, automatic sanitary pad vending, water monitoring, smell detection, and automatic ventilation, all facilitated through IOT technology. By presenting a cost-effective and efficient solution, this research contributes to the improvement of public sanitation in various settings, including homes, schools, colleges, hospitals, businesses, and industries, thereby promoting urban sanitation in the contemporary environment.



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CHAPTER 7

CONCLUSION

The implementation of automation in public washrooms presents a promising solution to enhance hygiene, efficiency, and user experience. Through sensor-activated faucets, soap dispensers, and hand dryers, this project aims to minimize physical contact, reduce water and energy wastage, and maintain cleanliness. By integrating smart technology and data analytics, the system can monitor usage patterns, detect maintenance needs, and optimize resource allocation. Furthermore, incorporating accessibility features ensures inclusivity for all users. However, challenges such as initial setup costs, maintenance requirements, and potential technological malfunctions must be carefully addressed. Despite these challenges, the long-term benefits of improved hygiene, resource conservation, and user satisfaction justify the investment in public washroom automation. As society continues to prioritize health and sanitation, this project represents a forward-thinking approach to meeting evolving needs in public spaces.

THE SCOPE

The future scope for public washroom automation is promising, with advancements in technology enabling more efficient and hygienic solutions. Areas of development could include:

Touchless Systems: Utilizing sensors to automate functions such as flushing, faucet operation, soap dispensing, and hand drying to minimize contact with surfaces and reduce the risk of germs.

Smart Monitoring: Implementing IoT devices and sensors to monitor restroom usage, detect low-stock levels, and manage supplies such as toilet paper, soap, and paper towels, ensuring efficient maintenance and restocking.



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**LPG GAS LEAKAGE DETECTION AND SAFETY
CONTROL SYSTEM**

A PROJECT REPORT

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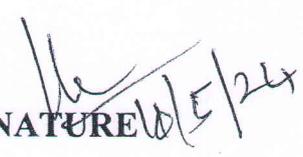
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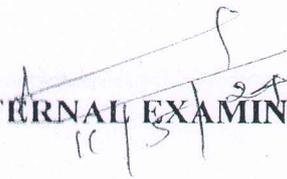
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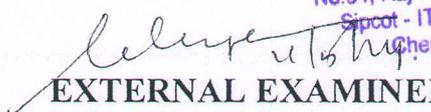
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ABSTRACT

Gas leakage poses a significant threat to both property and human life. To address this issue, this project proposes the development of a Gas Leakage Detection and Safety Control System. The purpose of this project is to design and implement a robust system capable of detecting gas leaks effectively and taking appropriate safety measures to prevent potential hazards. The system will consist of sensors strategically placed in areas prone to gas leaks, such as kitchens, industrial sites, and laboratories. These sensors will continuously monitor the air for the presence of gas particles, particularly those associated with common gases like methane, propane, and carbon monoxide. Upon detecting a gas leak, the system will trigger an alarm to alert occupants and nearby individuals of the potential danger. Simultaneously, it will initiate safety protocols to mitigate the risk. These protocols may include shutting off the gas supply, activating ventilation systems to disperse the gas, and notifying emergency services if necessary. Furthermore, the system will be designed with remote monitoring and control capabilities, allowing users to access real-time data on gas levels and system status through a smartphone application or web interface. This feature enhances convenience and enables prompt response to any detected anomalies, even when users are not on-site. Overall, the Gas Leakage Detection and Safety Control System aim to provide peace of mind to users by proactively identifying and addressing gas leaks, thereby minimizing the risk of fire, explosions, and health hazards associated with gas exposure. Through its comprehensive approach to gas safety, this project aims to contribute to a safer and more secure environment for both residential and industrial settings.



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CHAPTER 5

Conclusion

5.1 Conclusion :

In conclusion, gas leakage detection systems are integral for safeguarding lives and property against the potential hazards posed by gas leaks. By employing a combination of sensors, microcontroller units, alarm systems, safety shut-off valves, and communication modules, these systems can promptly detect the presence of harmful gases and initiate appropriate responses to mitigate risks. The general architecture of such systems encompasses a network of sensors for data collection, real-time processing by the microcontroller unit, decision-making based on analyzed data, and swift response mechanisms including alarms, safety protocols, and communication with stakeholders. Embracing an open architecture approach enhances adaptability and interoperability, ensuring seamless integration with other systems and devices for enhanced functionality and scalability. Overall, gas leakage detection systems play a vital role in maintaining a safe environment, providing early warning and preventive measures to minimize the impact of gas-related emergencies.

5.2 Future scope:

The feature scope of a gas leakage detection and safety control system encompasses a comprehensive suite of functionalities aimed at detecting, mitigating, and managing gas leaks within residential, commercial, and industrial settings. At its core, the system includes advanced gas sensors strategically positioned to detect the presence of hazardous gases such as methane, propane, or carbon monoxide. These sensors continuously monitor the environment, providing real-time data to a centralized control unit equipped with intelligent algorithms for data analysis and decision-making. Upon detecting abnormal gas levels, the system triggers immediate responses, including activating audible and visual alarms to alert occupants, initiating safety protocols such as shutting off gas valves to contain the leak, and communicating emergency notifications to designated stakeholders. Additionally, the system may offer advanced features such as remote monitoring and control capabilities via mobile applications or web interfaces, enabling facility managers to oversee gas safety operations remotely and facilitating prompt response to emergency situations. Furthermore, integration with building management systems and emergency response networks enhances the system's interoperability and effectiveness in safeguarding lives and property against the potentially catastrophic consequences of gas leaks. With its comprehensive feature scope, a gas leakage detection and safety control system serves as a vital safeguard, providing peace of mind and ensuring proactive measures are in place to mitigate the risks associated with gas-related incidents.



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**AI THERMOMETER USING ARDUINO
A PROJECT REPORT**

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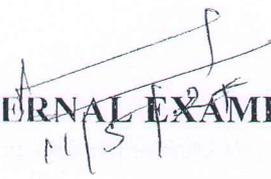
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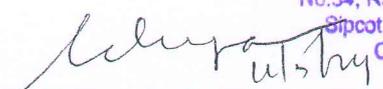
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ABSTRACT

The AI-Enhanced Thermometer project aims to transform temperature monitoring and control by integrating artificial intelligence (AI) technology. Conventional thermometers face challenges in accuracy, efficiency, and user-friendliness. Through the utilization of AI algorithms, our initiative aims to address these challenges and provide a more sophisticated and intelligent solution. The AI-Enhanced Thermometer employs state-of-the-art sensor technology in conjunction with machine learning algorithms to deliver precise real-time temperature measurements. Through continuous learning and adaptation, the device can refine its accuracy and precision over time. Additionally, it offers advanced functionalities such as predictive analytics to predict temperature variations and proactive alerts to address potential issues. Furthermore, the AI-Enhanced Thermometer is engineered to seamlessly integrate with smart home systems and healthcare facilities, facilitating remote monitoring and centralized temperature management. This integration enhances user convenience and enables proactive temperature regulation across diverse environments. In summary, the AI-Enhanced Thermometer project signifies a notable advancement in temperature monitoring technology, providing improved accuracy, efficiency, and user experience through the utilization of artificial intelligence.



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CHAPTER 7

CONCLUSION

AI contactless thermometers mark a significant advancement in temperature monitoring technology, revolutionizing the way we measure body temperature. By leveraging advanced wireless and sensor technology, these devices offer precise and hygienic solutions for various industries, from healthcare facilities to public events. Their ability to provide accurate temperature readings without physical contact enhances efficiency, safety, and convenience in temperature screening processes. Moreover, with features such as real-time data display and connectivity options, AI contactless thermometers empower users to make informed decisions. As we continue to prioritize health and safety in the face of global challenges, the widespread adoption of AI contactless thermometers underscores their vital role in safeguarding public health and promoting well-being. Moving forward, ongoing research and innovation will further enhance the capabilities of these devices, ensuring their effectiveness in addressing emerging health threats and contributing to a healthier future for all.



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IOT HEALTH SENTINEL REMOTE MONITORING FOR TIMELY CARE

A PROJECT REPORT

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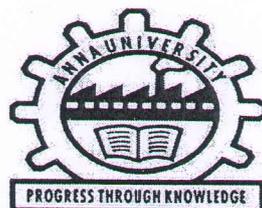
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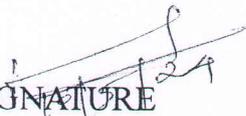
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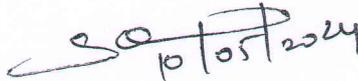
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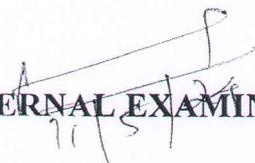
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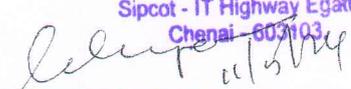

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ABSTRACT:

In an era where remote health monitoring and timely intervention are crucial for maintaining well-being, this project presents a comprehensive health monitoring system leveraging NodeMCU microcontroller, integrated sensors, and IoT technology.

The system continuously monitors vital signs such as body temperature, heart rate, and respiration rate using sensors integrated into wearable devices. Upon detecting abnormalities, instant alerts are triggered via Wi-Fi connectivity, while data is transmitted to an IoT web page for real-time monitoring by users and caretakers. Users can set personalized alerts for various health parameters through the web interface, facilitating proactive management of their health.

This project aims to enhance the overall well-being of individuals by providing timely alerts and continuous monitoring, ultimately preventing emergencies through swift intervention.

KEY WORDS:

Integrated health monitoring, body temperature sensor, optical heart rate sensor, respiration sensor.



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5.2 ADVANTAGES:

- Patients can be monitored and controlled remotely.
- Increase in convenience to patients.
- Lower cost.
- Power consumption

DISADVANTAGES:

- Lack of internet/connectivity issues.
- Added cost of internet
- No privacy
- Real time alert

5.3 CONCLUSION:

Iot Health Sentinel Remote Monitoring for Timely care has been proposed using Node MCU Chip, Temperature sensor, heart rate sensor, respiration sensor and various other Hardware Devices. Iot Health Sentinel Remote Monitoring for Timely care is very useful for the people who are in the remote place, where medical facilities is not available, avoiding frequent visit to the hospital, saving the environment by not calling the ambulance and saving the time, energy and money etc....



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Iot Based Energy Conservation using NODEMCU

A PROJECT REPORT

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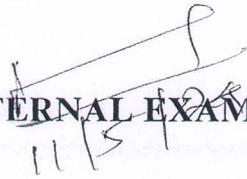
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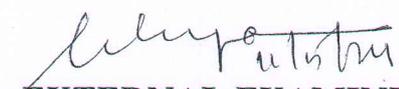
Project Viva Voice held on**11-05-2024**.....



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INTERNAL EXAMINER



EXTERNAL EXAMINER

ABSTRACT

Promoting the development of prototypes to empower individuals to monitor their energy consumption is crucial in today's world. With resources becoming scarcer and environmental concerns escalating, it's essential to offer accessible tools that facilitate responsible energy usage. Our project focuses on the creation of an IoT-based energy consumption monitoring system using advanced technology like the ESP-32 microcontroller, current/voltage sensors, and flow sensors. While the emphasis is on energy, the system provides a comprehensive solution that enables users to track and manage their energy consumption effectively.

Central to our initiative is the development of a user-friendly web interface using Visual Studio software. This interface serves as a dashboard, offering real-time insights into energy consumption patterns. By visualizing their usage data in an intuitive manner, users can identify opportunities for conservation and make informed decisions to optimize their energy usage. This not only empowers individuals to take control of their energy consumption but also fosters a culture of awareness and accountability regarding energy usage habits.

Beyond the technical aspects, our project seeks to foster a broader awareness of energy conservation principles. Through education and outreach efforts, we aim to highlight the importance of energy conservation and its impact on the environment and society. By engaging with communities and promoting sustainable practices, we strive to create a collective consciousness around energy usage and its implications. Ultimately, our goal is to inspire behavioral changes that lead to more efficient and sustainable energy consumption habits, contributing to a greener and more resilient future for all.



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CHAPTER 7

CONCLUSION

The Internet of Things based Smart Energy Meter helps in energy monitoring through the internet which provides us with real time power consumption and allows us to keep our consumption constantly in check. It eliminates the chances of manual error delay in processing and electricity theft thus we get accurate readings and justified electricity bills. The direct exchange of data between the meter and the utilities, made possible because of IOT, transforms it into an automated system that offers improved service quality and faster response time despite the reduced manual labour which in turn reduces the labour cost thus providing us with furthermore economic benefits.

FUTURE SCOPE

The future scope of IoT energy meters is vast and promising, with advancements poised to revolutionize how we manage and monitor energy consumption. These smart devices, equipped with sensors and connectivity capabilities, offer real-time data collection and analysis, enabling more efficient energy usage. One significant aspect of their future lies in their potential to seamlessly integrate with smart grids, facilitating optimized energy distribution and reducing wastage. Moreover, IoT energy meters hold the promise of fostering greater consumer awareness and engagement regarding energy consumption patterns, empowering individuals and businesses to make informed decisions for conservation and cost savings. As technology continues to evolve, we can anticipate even more sophisticated features, such as predictive analytics and machine learning algorithms, further enhancing the precision and effectiveness of energy management. Additionally, the integration of IoT energy meters with other smart devices and systems, like home automation platforms, opens up new avenues for comprehensive energy optimization and sustainability efforts. In essence, the future of IoT energy meters is characterized by increased efficiency, enhanced user empowerment, and a significant contribution to building smarter, more sustainable energy ecosystems.



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- Ability to analyze the characteristics and functions of relays and protection schemes.
- Ability to study about the apparatus protection, static and numerical relays.
- Ability to acquire knowledge on functioning of circuit breaker.

TEXT BOOKS:

1. Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2. B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3. Arun Ingole, 'Switch Gear and Protection' Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age International Pvt Ltd Publishers, Second Edition 2011.
2. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2010.
3. C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
4. RavindraP.Singh, 'Switchgear and Power System Protection', PHI Learning Private Ltd., NewDelhi, 2009.
5. VK Metha," Principles of Power Systems" S. Chand, 2005.
6. Bhavesh Bhalja, R.P. Maheshwari, Nilesh G. Chotani,'Protection and Switchgear' Oxford University Press, 2011.

EE8691

EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Building Blocks of Embedded System
- Various Embedded Development Strategies
- Bus Communication in processors, Input/output interfacing.
- Various processor scheduling algorithms.
- Basics of Real time operating system and example tutorials to discuss on one real time operating system tool.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor, selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I²C) –need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model,

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Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNIT V EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to understand and analyze Embedded systems.
- Ability to suggest an embedded system for a given application.
- Ability to operate various Embedded Development Strategies
- Ability to study about the bus Communication in processors.
- Ability to acquire knowledge on various processor scheduling algorithms.
- Ability to understand basics of Real time operating system.

TEXT BOOKS:

1. Peckol, "Embedded system Design", John Wiley & Sons,2010
2. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013
3. Shibu. K.V, "Introduction to Embedded Systems", 2e, Mc graw Hill, 2017.

REFERENCES

1. Raj Kamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.
2. C.R.Sarma, "Embedded Systems Engineering", University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning, 2009.
5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007.

EE8661 POWER ELECTRONICS AND DRIVES LABORATORY **L T P C**
0 0 4 2

OBJECTIVES:

- To provide hands on experience with power electronic converters and testing.

LIST OF EXPERIMENTS

- 1 Gate Pulse Generation using R, RC and UJT.
- 2 Characteristics of SCR and TRIAC
- 3 Characteristics of MOSFET and IGBT
- 4 AC to DC half controlled converter
- 5 AC to DC fully controlled Converter
- 6 Step down and step up MOSFET based choppers
- 7 IGBT based single phase PWM inverter



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- Ability to acquire knowledge on Fault analysis.
- Ability to model and understand various power system components and carry out power flow, short circuit and stability studies.

TEXT BOOKS:

1. John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
2. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
3. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.

REFERENCES

1. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
2. J. Duncan Glover, Mulukutla S.Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
3. Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
4. Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

EE8551

MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Architecture of μ P8085 & μ C 8051
- Addressing modes & instruction set of 8085 & 8051.
- Need & use of Interrupt structure 8085 & 8051.
- Simple applications development with programming 8085 & 8051

UNIT I 8085 PROCESSOR

9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR

9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions – Programming: Loop structure with counting & Indexing – Look up table - Subroutine instructions - stack.

UNIT III 8051 MICRO CONTROLLER

9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts– Timing Diagram – Interrupts- Data Transfer, Manipulation, Control Algorithms & I/O instructions, Comparison to Programming concepts with 8085.



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UNIT IV PERIPHERAL INTERFACING

9

Study on need, Architecture, configuration and interfacing, with ICs: 8255, 8259, 8254, 8279, - A/D and D/A converters & Interfacing with 8085 & 8051.

UNIT V MICRO CONTROLLER PROGRAMMING & APPLICATIONS

9

Simple programming exercises- key board and display interface –Control of servo motor- stepper motor control- Application to automation systems.

TOTAL : 45 PERIODS**OUTCOMES:**

- Ability to acquire knowledge in Addressing modes & instruction set of 8085 & 8051.
- Ability to need & use of Interrupt structure 8085 & 8051.
- Ability to understand the importance of Interfacing
- Ability to explain the architecture of Microprocessor and Microcontroller.
- Ability to write the assembly language programme.
- Ability to develop the Microprocessor and Microcontroller based applications.

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Muhammad Ali Mazidi & Janice Gilli Mazidi, R.D. Kinley 'The 8051 Micro Controller and Embedded Systems', PHI Pearson Education, 5th Indian reprint, 2003.

REFERENCES

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM," Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.
3. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051, McGraw Hill Edu,2013.
4. Ajay V.Deshmukh, 'Microcontroller Theory & Applications', McGraw Hill Edu,2016
5. Douglas V.Hall, 'Microprocessor and Interfacing', McGraw Hill Edu,2016.

EE8552

POWER ELECTRONICS

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on the following Topics

- Different types of power semiconductor devices and their switching
- Operation, characteristics and performance parameters of controlled rectifiers
- Operation, switching techniques and basics topologies of DC-DC switching regulators.
- Different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- Operation of AC voltage controller and various configurations.


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AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to acquire knowledge in IC fabrication procedure
- Ability to analyze the characteristics of Op-Amp
- To understand the importance of Signal analysis using Op-amp based circuits.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- To understand and acquire knowledge on the Applications of Op-amp
- Ability to understand and analyse, linear integrated circuits their Fabrication and Application.

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, 2013.
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.

REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla, "Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid, 'Microelectronic Circuits Analysis and Design' Cengage Learning, 2011.

IC8451

CONTROL SYSTEMS

PRINCIPAL

LTPC

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3204

COURSE OBJECTIVES

- To understand the use of transfer function models for analysis physical systems and introduce the control system components.
- To provide adequate knowledge in the time response of systems and steady state error analysis.
- To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.
- To introduce stability analysis and design of compensators

- To introduce state variable representation of physical systems

UNIT I SYSTEMS AND REPRESENTATION 9

Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 9

Time response: – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Root locus construction- Effects of P, PI, PID modes of feedback control –Time response analysis.

UNIT III FREQUENCY RESPONSE 9

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response - Correlation between frequency domain and time domain specifications

UNIT IV STABILITY AND COMPENSATOR DESIGN 9

Characteristics equation – Routh Hurwitz criterion – Nyquist stability criterion- Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag-lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS 9

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL (L: 45+T:30): 75 PERIODS

COURSE OUTCOMES

At the end of the course, the student should have the :

- Ability to develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.
- Ability to do time domain and frequency domain analysis of various models of linear system.
- Ability to interpret characteristics of the system to develop mathematical model.
- Ability to design appropriate compensator for the given specifications.
- Ability to come out with solution for complex control problem.
- Ability to understand use of PID controller in closed loop system.

TEXT BOOKS

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers, 2017.
2. Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014.

REFERENCES

1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education, 2009.
3. John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor & Francis Reprint 2009.
4. Rames C.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5. M.Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
6. NPTEL Video Lecture Notes on "Control Engineering "by Prof. S. D. Agashe, IIT Bombay.



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OBJECTIVES:

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters
- To understand the basic principles in imaging techniques
- To have a basic knowledge in life assisting and therapeutic devices

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems -Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - **Temperature measurements** - Fibre optic temperature sensors

UNIT II NON ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers, pH of blood –measurement of blood pCO₂, pO₂, finger-tip oxymeter - ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system - Nano Robots - Robotic surgery –Orthopedic prostheses fixation.

TOTAL : 45 PERIODS**OUTCOMES: At the end of the course students will have the**

- Ability to understand the philosophy of the heart, lung, blood circulation and respiration system.
- Ability to provide latest ideas on devices of non-electrical devices.
- Ability to gain knowledge on various sensing and measurement devices of electrical origin.
- Ability to understand the analysis systems of various organ types.
- Ability to bring out the important and modern methods of imaging techniques and their


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analysis.

- Ability to explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi, 2nd edition, 2003
3. Joseph J Carr and John M. Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012.

REFERENCES

1. John G. Webster, Medical Instrumentation Application and Design, John Wiley and sons, New York, 1998.
2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

GE8073

FUNDAMENTALS OF NANOSCIENCE

L T P C
3 0 0 3

OBJECTIVES:

To learn about basis of nanomaterial science, preparation method, types and application

UNIT I INTRODUCTION

8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION

9

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO₂, MgO, ZrO₂, NiO, nanoalumina, CaO, AgTiO₂, Ferrites, Nanoclays- functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

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OUTCOMES:

- Ability to understand the day-to-day operation of electric power system.
- Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- Ability to understand the significance of power system operation and control.
- Ability to acquire knowledge on real power-frequency interaction.
- Ability to understand the reactive power-voltage interaction.
- Ability to design SCADA and its application for real time operation.

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.



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EE8703

RENEWABLE ENERGY SYSTEMS

OBJECTIVES:

To impart knowledge on the following Topics

- Awareness about renewable Energy Sources and technologies.
- Adequate inputs on a variety of issues in harnessing renewable Energy.
- Recognize current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES

9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY

9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs–Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

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OUTCOMES:

- Ability to understand the day-to-day operation of electric power system.
- Ability to analyze the control actions to be implemented on the system to meet the minute-to-minute variation of system demand.
- Ability to understand the significance of power system operation and control.
- Ability to acquire knowledge on real power-frequency interaction.
- Ability to understand the reactive power-voltage interaction.
- Ability to design SCADA and its application for real time operation.

TEXT BOOKS:

1. Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2. Allen. J. Wood and Bruce F. Wollen berg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
3. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath, I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
3. Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.



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EE8703

RENEWABLE ENERGY SYSTEMS

OBJECTIVES:

To impart knowledge on the following Topics

- Awareness about renewable Energy Sources and technologies.
- Adequate inputs on a variety of issues in harnessing renewable Energy.
- Recognize current and possible future role of renewable energy sources.

UNIT I RENEWABLE ENERGY (RE) SOURCES

9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.

UNIT II WIND ENERGY

9

Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs–Working of WPPs- Siting of WPPs-Grid integration issues of WPPs.

UNIT III SOLAR PV AND THERMAL SYSTEMS

9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds.- Thermal Energy storage system with PCM- Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, Efficiency & Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNIT IV BIOMASS ENERGY

9

Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine, Turbine theory, Essential components of hydroelectric system.

UNIT V OTHER ENERGY SOURCES

9

Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications. Energy Storage System- Hybrid Energy Systems.

TOTAL : 45 PERIODS

OUTCOMES:

- Ability to create awareness about renewable Energy Sources and technologies.
- Ability to get adequate inputs on a variety of issues in harnessing renewable Energy.
- Ability to recognize current and possible future role of renewable energy sources.
- Ability to explain the various renewable energy resources and technologies and their applications.
- Ability to understand basics about biomass energy.
- Ability to acquire knowledge about solar energy.

TEXT BOOKS:

1. Joshua Earnest, Tore Wizeliu, 'Wind Power Plants and Project Development', PHI Learning Pvt.Ltd, New Delhi, 2011.
2. D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3. Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016.



PRINCIPAL

College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 600 033.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011
2. Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
3. Chetan Singh Solanki, " Solar Photovoltaics : Fundamentals, Technologies and Applications", PHI Learning Private Limited, New Delhi, 2011
4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis," Engineering Applications in Sustainable Design and Development", Cengage Learning India Private Limited, Delhi, 2016.
5. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.
6. Shobh Nath Singh, 'Non-conventional Energy resources' Pearson Education ,2015.



MOHAMED SATHAK A.J. COLLEGE OF ENGINEERING
(Approved by AICTE, New Delhi and Affiliated to Anna University, Chennai)



S.NO	COMPANY NAME	SUBJECT CODE	STUDENT NAME
1	Comnizo Solutions	GE3151-Problem Solving and Python Programming	J.Abdul Malik
2	Cognifyz Technologies	CS3353-C Programming and Data Structures	J.Abdul Malik
3	National Institute of Wind Energy	EE3402-Linear Integrated Circuits	Srikarthik.V
4	CodSoft	CS8392-Object Oriented Programming	Arshad.K
5	Meriskill	GE8151-Problem Solving and Python Programming	Arshad.K
6	Academor	EVA033-Electric Vehicles	Arshad.K
7	CodSoft	CS8392-Object Oriented Programming	Mohamed Unais,A
8	SlayLewks	GE8151-Problem Solving and Python Programming	Mohamed Unais,A
9	Shiash Info Solutions Private Limited	GE8151-Problem Solving and Python Programming	Divya Sri.S

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34, Rajiv Gandhi Road (OMR), Siruseri, IT Park
Chennai-603 103.

C.ID: 31e639f



CERTIFICATE

OF COMPLETION
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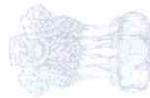
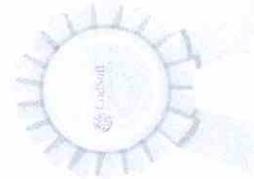
Arshad K

has successfully completed 4 weeks of a virtual internship program in
Machine Learning
with wonderful remarks at **CODSOFT** from 05/09/2023 to 05/10/2023.

We were truly amazed by his/her showcased skills and invaluable contributions to
the tasks and projects throughout the internship.



Founder



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Sipcot - IT Highway Egattur,
Chennai - 603103.

contact@codsoft.in

www.codsoft.in

Date: 11/10/2023

11th June 2024

INTERNSHIP COMPLETION CERTIFICATE

This is to certify **Ms. Divya Sri S (Reg.No. 311820105003)** Student of **B.E.,(Electrical and Electronics Engineering) Mohamed Sathak A. J. College of Engineering - Chennai** has successfully completed the Internship **Data Analytics** platform from **March 2024 to June 2024** in our company. During the period, she had been exposed to different processes and found to be Punctual, Hard Working and Inquisitive.

We wish her every success in life and career.

For **Shiash Info Solutions Private Limited**



Ashwini Kanniyappan

Manager – Human Resources



PRINCIPAL
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No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

Shiash Info Solutions Private Limited
#51, Level 3, Tower C, Ratttha TEK Meadows, Old Mahabalipuram Road,
Sholinganallur, Chennai – 600 119, Tamil Nadu, India
+91 80158 07428 info@shiash.com

Meri
SKILL

Certificate Of COMPLETION

MeriSKILL

Grants and certifies
this certificate on

10 OCTOBER, 2023

CNMS20

This Certificate Is Given To

ARSHAD K

Because HE/SHE has completed an internship program for 30
Days as "DATA ANALYST" at MeriSKILL with an "A" grade in
Python, SQL and Power BI / Tableau.



MeriSKILL.COM



MSME

DIGITALLY VERIFIED
W. h. =
PRINCIPAL
Mohamed Sathak A.J. College of Engineering
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Sipcot - IT Highway Egattur,
Chennai - 603103.

Cognifyz

Where Data Meets Intelligence

Cognifyz Technologies

Internship Completion Certificate

Date - 17/02/2024

This is to certify that **J Abdul Malik, (Intern ID: CTI/A1/C12027)** currently pursuing a B.E. from Mohamed Sathak AJ College Of Engineering, was working as a **Full Stack Development Intern** with Cognifyz Technologies from January 2024 - February 2024.

During this period, he has served as a Full Stack Development Intern and has displayed remarkable dedication, sincerity, and a strong desire to learn. He has exhibited exceptional coordination skills and effective communication abilities. Moreover, his attention to detail has been truly impressive.

He has consistently approached new assignments and challenges with enthusiasm, showcasing his passion for Full Stack Development. His commitment and willingness to acquire new knowledge and skills have been evident throughout his internship.

We extend our best wishes to J Abdul Malik for a successful future, and we have no doubt that he will continue to excel in the field of Full Stack Development.

Sahillambat

With Regards,
Cognifyz Technologies



[Signature]
PRINCIPAL

Mohamed Sathak A.J. College of Engineering
No.34, Rajiv Gandhi Salai (OMR)
Sipcot - IT Highway Egattur,
Chennai - 603103.

✉ cognifyztechnologies@gmail.com

🌐 www.cognifyz.com

Comnizo Solutions



March, 2024

Comnizo Solutions
Hyderabad
Telangana

Dear **J Abdul Malik**,

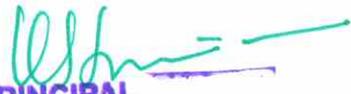
Subject: **Internship Completion Certificate.**

This is to certify that Mr./Ms. J Abdul Malik has successfully completed a 1-month internship at Comnizo in the field of Web Development. The internship tenure spanned from 15th January, 2024, to February, 2024.

Throughout the internship, J Abdul Malik actively engaged in diverse tasks within the Web Development domain. Notably, they played a pivotal role in a client demo project, showcasing exceptional skills and dedication.

J Abdul Malik, demonstrated commendable hard work, enthusiasm, and a strong commitment to excellence. Their proactive approach and ability to tackle challenges reflect a promising foundation for a successful career in Web Development.

During the internship, J Abdul Malik consistently displayed dedication and a proactive attitude towards learning. Their enthusiasm for taking on new tasks and overcoming obstacles was evident in every project undertaken. These qualities underscore their potential to excel in Web Development and contribute meaningfully to future endeavors.


PRINCIPAL

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Chennai - 603103.



नीवे NIWE
(ISO 9001 Certified)

राष्ट्रीय पवन ऊर्जा संस्थान NATIONAL INSTITUTE OF WIND ENERGY

(पूर्व में "पवन ऊर्जा प्रौद्योगिकी केन्द्र" Formerly "Centre for Wind Energy Technology")

(नवीन और नवीकरणीय ऊर्जा मंत्रालय, भारत सरकार Ministry of New and Renewable Energy, Government of India)

नीवे/अनुसंधान एवं विकास/ इंटरशिप / 2023-24
NIWE / R & D / Internship -49/ 2023-24

दिनांक : 3 अगस्त 2023
Date: 03.08.2023

सभी संबंधितों को TO WHOMSOEVER IT MAY CONCERN

यह प्रमाणित किया जाता है कि श्री/सुश्री/श्रीमती श्रीकार्तिक.वी, B.E. (इलेक्ट्रिकल और इलेक्ट्रॉनिक्स अभियांत्रिकी) (पंजीकरण सं 311821105012), मुहम्मद सातक ए जे कॉलेज ऑफ इंजीनियरिंग, चेन्नई, ने राष्ट्रीय पवन ऊर्जा संस्थान में 3 जुलाई 2023 से 3 अगस्त 2023की अवधि में इंटरशिप कार्यक्रम पूर्ण किया है तथा "चरणबद्ध बंद लूप एवं आरई-ग्रिड एकीकरण" विषय पर रिपोर्ट प्रस्तुत किया है।

This is to Certify that **Shri / Ms. SRIKARTHIK.V, B.E (Electrical and Electronics Engineering)** (Reg. No. 311821105012) Mohamed Sathak A J College of Engineering, Chennai, has completed an internship at National Institute of Wind Energy, Chennai from 3rd July 2023 to 3rd August 2023 and submitted a report on "PHASE LOCKED LOOP AND RE-GRID INTEGRATION".

इंटरशिप की अवधि में उन्होंने आवश्यक अनुशासन, सावधानी निरूपित किया है तथा इंटरशिप पूर्ण करने हेतु आवश्यक कौशल में विशेषज्ञता प्रदर्शित की है।

During the course of internship, he demonstrated the required discipline, rigour and expertise over the skills required for the completion of this internship.



M.C. Lavanya

एम. सी. लावण्या
M.C. LAVANYA

उप निदेशक (तकनीकी) एवं प्रकोष्ठ प्रमुख,
अनुसंधान एवं विकास
Deputy Director (Technical)&
Unit Chief, R & D

Mohamed Sathak A.J.

PRINCIPAL

Mohamed Sathak A.J. College of Engineering
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Chennai - 603103.

वेलाचेरी - ताम्बरम मुख्य मार्ग, पल्लिकरणई, चेन्नै - 600 100. तमिल नाडु, भारत
Velachery - Tambaram Main Road, Pallikaranai, Chennai - 600 100. Tamil Nadu, INDIA

दूरभाष/Tel No.: +91 - 44 - 2246 3982 / 83 / 84, +91 - 44 - 2900 1162 / 1167 / 1195

फैक्स/Fax No.: +91 - 44 - 2246 3980 / 2246 3990

ई-मेल/E-mail : info@niwe.res.in वेबसाइट/Website : http://niwe.res.in



CERTIFICATE OF COMPLETION

TO WHOMSOEVER IT MAY CONCERN

Mohamed Unais A- Student of Mohammed Sathak college has completed his internship with Slaylewks as a Campus Ambassador and Data Onboarding Intern. His internship was from 15th April to 25th August, 2023.

Through the course of the internship, his performance was good and he contributed to the growth of the app Slaylewks by getting downloads for the app, supporting in social media and onboarding the data of salon vendors onto the platform.

ANUTHAMA MURUGESAN
FOUNDER AND CEO



PRINCIPAL
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Sipcot - IT Highway Egattur,
Chennai - 603103.

C.ID: 1df59a1



CERTIFICATE

OF COMPLETION
PROUDLY PRESENTED TO

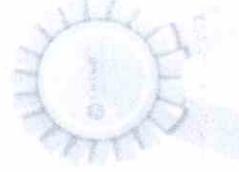
MOHAMED UNAISA A

has successfully completed 4 weeks of a virtual internship program in
Data Science
with wonderful remarks at **CODSOFT** from 25/08/2023 to 25/09/2023.
We were truly amazed by his/her showcased skills and invaluable contributions to
the tasks and projects throughout the internship.





Founder



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Date: 27/09/2023



PRINCIPAL

Mohamed Sathak
Principal
Department of Engineering
Sels, (O&A)

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GE3151

PROBLEM SOLVING AND PYTHON PROGRAMMING

L T P C
3 0 0 3**COURSE OBJECTIVES:**

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 9

Conditionals:Boolean values and operators, conditional (if), alternative (if-else),chained conditional (if-elif-else);Iteration: state, while, for, break, continue, pass; Fruitful functions: return values,parameters, local and global scope, function composition, recursion; Strings: string slices,immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES 9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES 9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL : 45 PERIODS


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Chennai - 603103.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- CO1: Develop algorithmic solutions to simple computational problems.
- CO2: Develop and execute simple Python programs.
- CO3: Write simple Python programs using conditionals and loops for solving problems.
- CO4: Decompose a Python program into functions.
- CO5: Represent compound data using Python lists, tuples, dictionaries etc.
- CO6: Read and write data from/to files in Python programs.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. <https://www.python.org/>
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	-	-	-	-	2	2	3	3	-
2	3	3	3	3	2	-	-	-	-	-	2	2	3	-	-
3	3	3	3	3	2	-	-	-	-	-	2	-	3	-	-
4	2	2	-	2	2	-	-	-	-	-	1	-	3	-	-
5	1	2	-	-	1	-	-	-	-	-	1	-	2	-	-
6	2	2	-	-	2	-	-	-	-	-	1	-	2	-	-
Avg.	2	3	3	3	2	-	-	-	-	-	2	2	3	3	-



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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PS02	PS03
CO1	3	3	1	1	1	-	-	1	-	-	-	1	3	2	2
CO2	3	3	1	1	1	-	-	1	-	-	-	1	3	1	1
CO3	3	3	1	1	1	-	-	1	-	-	-	1	3	1	1
CO4	3	3	1	1	1	-	-	1	-	-	-	1	3	3	2
CO5	3	3	1	1	1	-	-	1	-	-	-	1	3	3	2
CO6	3	3	1	1	1	-	-	1	-	-	-	1	3	3	2
Avg	3	3	1	1	1	-	-	1	-	-	-	1	3	3	3

CS3353

C PROGRAMMING AND DATA STRUCTURES

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce the basics of C programming language.
- To learn the concepts of advanced features of C.
- To understand the concepts of ADTs and linear data structures.
- To know the concepts of non-linear data structure and hashing.
- To familiarize the concepts of sorting and searching techniques.

UNIT I C PROGRAMMING FUNDAMENTALS (8+1 SKILL)

9

Data Types – Variables – Operations – Expressions and Statements – Conditional Statements – Functions – Recursive Functions – Arrays – Single and Multi-Dimensional Arrays.

UNIT II C PROGRAMMING - ADVANCED FEATURES (8+1 SKILL)

9

Structures – Union – Enumerated Data Types – Pointers: Pointers to Variables, Arrays and Functions – File Handling – Preprocessor Directives.

UNIT III LINEAR DATA STRUCTURES (8+1 SKILL)

9

Abstract Data Types (ADTs) – List ADT – Array-Based Implementation – Linked List – Doubly- Linked Lists – Circular Linked List – Stack ADT – Implementation of Stack – Applications – Queue ADT – Priority Queues – Queue Implementation – Applications.

UNIT IV NON-LINEAR DATA STRUCTURES (8+1 SKILL)

9

Trees – Binary Trees – Tree Traversals – Expression Trees – Binary Search Tree – Hashing - Hash Functions – Separate Chaining – Open Addressing – Linear Probing– Quadratic Probing – Double Hashing – Rehashing.



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UNIT V SORTING AND SEARCHING TECHNIQUES (8+1 SKILL)

9

Insertion Sort – Quick Sort – Heap Sort – Merge Sort – Linear Search – Binary Search.

TOTAL: 45 PERIODS**SKILL DEVELOPMENT ACTIVITIES (Group Seminar/Mini Project/Assignment/Content Preparation / Quiz/ Surprise Test / Solving GATE questions/ etc)**

5

COURSE OUTCOMES:

- CO1 Develop C programs for any real world/technical application.
 CO2 Apply advanced features of C in solving problems.
 CO3 Write functions to implement linear and non-linear data structure operations.
 CO4 Suggest and use appropriate linear/non-linear data structure operations for solving a given problem.
 CO5 Appropriately use sort and search algorithms for a given application.
 CO6 Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval.

TEXT BOOKS:

1. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 1997.
2. ReemaThareja, "Programming in C", Second Edition, Oxford University Press, 2016.

REFERENCES:

1. Brian W. Kernighan, Rob Pike, "The Practice of Programming", Pearson Education, 1999.
2. Paul J. Deitel, Harvey Deitel, "C How to Program", Seventh Edition, Pearson Education, 2013.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
4. Ellis Horowitz, SartajSahni and Susan Anderson, "Fundamentals of Data Structures", Galgotia, 2008.

List of Open Source Software/ Learning website:<https://www.coursera.org/specializations/data-structures-algorithms><https://nptel.ac.in/courses/112107243><https://nptel.ac.in/courses/112105598>


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MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	3	1	2	2	1	1	-	1	2	1	3	2	1	3
2	1	2	1	2	2	-	-	-	1	1	1	2	2	2	2
3	2	3	1	2	3	-	-	-	1	1	1	2	2	1	2
4	2	1	-	1	1	-	-	-	2	1	1	2	2	3	1
5	1	2	1	2	2	1	1	-	1	2	1	3	2	2	3
Avg.	2	2	1	2	2	1	1	-	1	1	1	2	2	2	2

2013

7. Hadi Saadat, 'Power System Analysis', McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition, 23rd reprint, 2015.
8. R.K.Rajput, 'A Text Book of Power System Engineering' 2nd edition, Laxmi Publications (P) Ltd, New Delhi, 2016.

COURSE OUTCOMES

On the successful completion of the course, students will be able to:

- CO1 : Understand the structure of power system, computation of transmission line parameters for different configurations.
- CO2 : Model the transmission lines to determine the line performance and to understand the impact of Ferranti effect and corona on line performance.
- CO3 : Do Mechanical design of transmission lines, grounding and to understand about the insulators in transmission system.
- CO4 : Design the underground cables and understand the performance analysis of underground cable.
- CO5 : Understand the modelling, performance analysis and modern trends in distribution system.

MAPPING OF COs WITH POs AND PSOs

COs	POs												PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	1	-	-	-	-	3	1	1
CO2	3	2	1	1	-	1	-	2	-	-	-	-	3	2	1
CO3	3	2	1	1	-	1	-	2	-	-	-	-	3	3	1
CO4	3	2	1	1	-	1	-	2	-	-	-	-	3	3	1
CO5	3	2	1	1	-	1	-	2	-	-	-	-	3	3	1
Avg	2.8	1.8	1	1		1	-	1.8					3	2.4	1

EE3402

LINEAR INTEGRATED CIRCUITS

L T P C
3 0 0 3

COURSE OBJECTIVES:

To impart knowledge on the following topics

- Signal analysis using Op-amp based circuits.
- Applications of Op-amp.
- Functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits.
- IC fabrication procedure.

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 Chennai - 603103.

UNIT I IC FABRICATION

9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance,

[Faint, illegible text at the bottom left corner]

resistance, FETs and PV Cell.

UNIT II CHARACTERISTICS OF OPAMP

9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Voltage-shunt feedback and inverting amplifier - Voltage series feedback: and Non-Inverting Amplifier - Basic applications of op-amp –, summer, differentiator and Integrator-V/I & I/V converters.

UNIT III APPLICATIONS OF OPAMP

9

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analog multiplier & Divider, first and second order active filters, comparators, multi vibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using OP-AMPs.

UNIT IV SPECIAL ICs

9

Functional block, characteristics of 555 Timer and its PWM application - IC-566 voltage controlled oscillator IC; 565-phase locked loop IC, AD633 Analog multiplier ICs.

UNIT V APPLICATION ICs

9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltage regulators –LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply - LM317, 723 Variability voltage regulators, switching regulator- SMPS - ICL 8038 function generator IC.

TOTAL :45 PERIODS

COURSE OUTCOMES:

Upon successful completion of the course, the students will be able to:

- CO1 Explain monolithic IC fabrication process
- CO2 Explain the fabrication of diodes, capacitance, resistance, FETs and PV Cell.
- CO3 Analyze the characteristics and basic applications (inverting/non-inverting amplifier, summer, differentiator, integrator, V/I and I/V converter) of Op-Amp
- CO4 Explain circuit and applications of op-amp based instrumentation amplifier, log/antilog amplifier, analog multiplier /divider, active filters, comparators, waveform generators, A/D and D/A converters
- CO5 Explain Functional blocks, characteristics and applications of Timer, PLL, analog multiplier ICs.
- CO6 Explain the applications of ICs in Instrumentation amplifier, fixed and variable voltage regulator, SMPS and function generator

TEXT BOOKS:

1. David A. Bell, 'Op-amp & Linear ICs', Oxford, Third Edition, 2011
2. D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', , New Age, Fourth Edition, 2018.
3. Ramakant A. Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, PHI 2021.

REFERENCES

1. Fiore, "Opamps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd ,Buchla, "Fundamentals of Analog Circuits, Pearson, 2013.
3. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2nd Edition, 2017.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', Pearson, 6th edition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill,

- and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
 3. Lonnie C.Ludeman, "Fundamentals of Digital Signal Processing", Wiley, 2013

REFERENCES

1. Poorna Chandra S, Sasikala. B, Digital Signal Processing, Vijay Nicole/TMH, 2013.
2. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning, 2014.
3. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010 3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. SenM.kuo, woonseng...s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson, 2013
5. DimitrisG.Manolakis, Vinay K. Ingle, applied Digital Signal Processing, Cambridge, 2012

CS8392

OBJECT ORIENTED PROGRAMMING

L T P C
3 0 0 3

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS

10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES

9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O

9

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING

8

Differences between multi-threading and multitasking, thread life cycle, creating threads,


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synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING

9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Upon completion of the course, students will be able to:

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

TEXT BOOKS

1. Herbert Schildt, "Java The complete reference", 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.

REFERENCES

1. Paul Deitel, Harvey Deitel, "Java SE 8 for programmers", 3rd Edition, Pearson, 2015.
2. Steven Holzner, "Java 2 Black book", Dreamtech press, 2011.
3. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

EE8511	CONTROL AND INSTRUMENTATION LABORATORY	L	T	P	C
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OBJECTIVES:

- To provide knowledge on analysis and design of control system along with basics of instrumentation.

LIST OF EXPERIMENTS

CONTROLSYSTEMS:

1. P, PI and PID controllers
2. Stability Analysis
3. Modeling of Systems – Machines, Sensors and Transducers
4. Design of Lag, Lead and Lag-Lead Compensators
5. Position Control Systems
6. Synchro-Transmitter- Receiver and Characteristics
7. Simulation of Control Systems by Mathematical development tools.



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batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015
3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:

1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

GE8151

PROBLEM SOLVING AND PYTHON PROGRAMMING

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING

9

Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS

9

Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.



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UNIT III CONTROL FLOW, FUNCTIONS

9

Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES

9

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES

9

Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.

COURSE OUTCOMES:

Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/think-python/>)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:

1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
6. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd., 2015.