



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited A++ Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

School of Electrical & Electronics

Department of Electrical and Electronics Engineering

Syllabus Revision and New courses from June 2023- May 2024

SNO	SUB CODE	SUBJECT NAME	Focused Towards
1.	SEEA1702	Principles of Embedded System Design	Employability
2.	SEEA2701	Embedded and DSP Lab	Skill Development
3.	S14BLH21	Circuit Theory and Network Analysis	Skill Development
4.	SEEB2204	Electronic Devices Lab	Skill Development
5	SEEA7016	Advanced Optimization Technique	Employability
6	SEEA7017	Simulation of Power Electronic Systems	Employability



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SCHOOL OF ELECTRICAL AND ELECTRONICS

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Minutes of Board of Studies Meeting held on 20th May, 2023

Venue : Board Room, Ground Floor, School of EEE

- The meeting was opened by Dr. N.M. Nandhitha, Professor and Dean of the School of Electrical and Electronics, who welcomed both internal and external attendees to the Board of Studies meeting, which was scheduled for May 20th, 2023, from 10:30 a.m. to 12:00 p.m.
- The head of the department of electrical and electronics engineering, Dr. V. Sivachidambaranathan, told the board that core competences had been determined using input gathered from employers, instructors, alumni, and students.
- Dr. Radhika S. gave an explanation and rationale for the modifications made to the course Principles of Embedded System Design. She recommended adding lessons on ARDUINO, architecture, integrating various sensors and communication modules, hardware timers, watchdogs, and interrupt handling in Arduino, as well as applying Arduino to control embedded system-based devices in Unit II. The external member, Dr. N. Shivakumaran, Professor at NIT, Tiruchy, approved the modifications and suggested adding more material in Unit III, including instructions on the Fundamentals of ARM, the Barrel Shifter, Classification and Explanation of Instructions with Examples, Data Processing, Branch, Load-store, SWI, and Program Status Register.
- Furthermore, Dr. M.D. Selvaraj, an associate professor at IIITDM in Kancheepuram, recommended that Unit V cover topics like function queue scheduling architecture and round robin and round-robin with interruptions.
- Dr. S. Radhika also recommended adding topics to Unit V, including priority inversion, priority inheritance, mailbox, pipes, semaphores, and interprocess communication and synchronization. In addition, she included a topic in Unit V that compared real-time operating systems, such as VxWorks,

uC/OS-II, and RT Linux.

- Additionally, Dr. S. Radhika suggested adding experiments to the Embedded and DSP Lab. These experiments should include PIC16F877-based arithmetic and logical operations as well as Arduino- based wireless communication modules, sensors, motor speed control, and temperature monitoring. She also included experiments using the Arm processor in it. The modifications made to the Embedded and DSP lab course were approved by Dr. M.D. Selvaraj, Associate Professor, IIITDM, External Member.
- New courses Advanced Optimization techniques and Simulations of Power Electronic System for ME Power Electronics and Industrial Drives were put forth by Dr. Barnabass Paul Gladly before the board members. Board members recognized the significance of Simulating Power Electronic Systems using modern software tools like PSpice, MATLAB/Simulink, and PSIM.
- An audit course is one in which students attend the course without receiving a formal grade or credit. For the post graduate students, the external members suggested that, audit courses might be optional and available for students who wish to learn about a topic without affecting their GPA. They suggested that it can be mandatory for UG students.
- They highlighted the course's potential to bridge theoretical knowledge with practical applications in designing efficient power systems. Members suggested incorporating more hands-on lab sessions to reinforce simulation skills and troubleshooting techniques.
- Both proposed courses received positive feedback from the board members, who expressed enthusiasm for their potential contributions to student education and industry relevance.
- The minutes highlighted a commitment to refining course content to meet current technological advancements and educational standards in optimization techniques and power electronic simulations

External Members



Dr. N. Shivakumaran

Professor

Dept of I & C NIT, Trichy



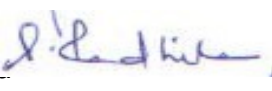
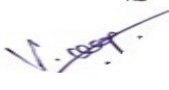
Dr, M. D. Selvaraj

Associate Professor,

IIITDM, Kancheepuram

The following internal and external members were present in the meeting

Internal Members

1. Dr.N.M.Nandhitha 
2. Dr.V.Sivachidambaranathan 
3. Dr.S.Radhika 
4. Dr.D.Susitra
5. Dr.S.Nirmal Raj 
6. Dr.M.Kavitha 
7. Dr.P.Sivagami 
8. Dr.J.Barnabas Paul Gladly 
9. Mrs.D.Ramya 
10. Dr.V.Senthil Nayagam 
11. Dr.M.Pushpavalli 



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1.1.2 Syllabus Revision in May 2023

NO	SUB CODE	SUBJECT NAME	Focused Towards
1.	SEEA1702	Principles of Embedded System Design	Employability
2.	SEEA2701	Embedded and DSP Lab	Skill Development

SECA1706	PRINCIPLES OF EMBEDDED SYSTEM DESIGN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- 8 bit RISC microcontroller.
- 8 bit CISC.
- Real time operating system

UNIT1 8051 MICROCONTROLLER ARCHITECTURE 9Hrs.

Comparison of microprocessors and microcontrollers - 8051 architecture - hardware, I/O pins, ports, memory, counters, timers, serial I/O interrupts.

UNIT2 PROGRAMMING OF 8051 9Hrs.

Addressing modes - Instruction sets - Simple programs with 8051 -I/O Programming.- Timer programming- Serial communication programs- Interrupt programming- Memory programming- Delay Programs.

UNIT3 RISC EMBEDDED CONTROLLERS 9Hrs.

Comparison of CISC and RISC controllers - PIC 16F877 architecture - Memory organization - Addressing modes - Assembly language instructions- ARM 7 Architecture-Register organization- Modes and states. Overview of Intel ARM based hard processor System on Chip (SoC) with an on chip FPGA - Overview of System on Module (SoM) using ARM based SoC.

UNIT4 DISTRIBUTED EMBEDDED SYSTEM DESIGN 9Hrs.

Distributed Embedded system - Embedded networking -RS 232 - RS485 - Inter-Integrated Circuit (I2C) - Serial Peripheral Interface (SPI) - Universal Serial Bus (USB) - Controller Area Network (CAN)- Ethernet.

UNIT5 REAL TIME OPERATING SYSTEMS 9Hrs.

Introduction to assembler - Compiler -Cross compilers -Linker/ Locators – Simulators Introduction - Desktop OS versus RTOs - Task management - Task scheduling - Race conditions - Priority Inversion - ISRs and Scheduling - Intertask Communication.

Max. 45 Hrs



Insertion



Deletion



New Course

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Remember the pin details, specifications, register configurations and explain the internal operations of 8051 microcontroller.
- CO2 - Explain the addressing modes, Instruction sets and able to write assembly language programs based on 8051 microcontroller.
- CO3 - Remember the pin details, specifications and register configurations and explain the internal operations of PIC 16F877A Microcontroller.
- CO4 - Categorize and compare the suitability of various interfacing bus devices for applications.
- CO5 - Understand the basics of RTOs.
- CO6 - Explain the concept of RTOs in real time embedded system.

TEXT / REFERENCE BOOKS

1. Kenneth. J. Ayala, "The 8051 Microcontroller Architecture, Programming and Applications", Penram International, 1996, 2nd Edition.
2. Sriram. V. Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", 2004 Tata McGraw Hill Publishing Company Limited, 2006.
3. Frank Vahid, Tony Givargis, 'Embedded system Design - A unified Hardware / software Introduction', John Wiley and Sons, 2002.
4. Todd D Morton, 'Embedded Microcontrollers', Reprint by 2005, Low Price Edition.
5. Muhammed Ali Mazidi, Janice Gillispie Mazidi, 'The 8051 Microcontroller and Embedded Systems', Low Price Edition, Second Impression 2006.
6. Raj Kamal, 'Embedded Systems-Architecture, Programming and Design', Tata McGraw Hill Publishing Company Limited 2003.
7. Muhammed Ali Mazidi, Rolin D. McKinlay, Dannycauscy, "PIC microcontrollers and embedded systems using assembly and C", 1st edition, Pearson, 2007.



Insertion



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New Course

SEEA1702	PRINCIPLES OF EMBEDDED SYSTEM DESIGN	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- 8 bit RISC microcontroller.
- ARDUINO
- ARM Processor
- Real time operating system

UNIT 1 RISC EMBEDDED CONTROLLER

9 Hrs.

Comparison of CISC and RISC controllers - PIC 16F877 architecture - Memory organization - Addressing modes - Assembly language instructions.

UNIT 2 ARDUINO

9 Hrs.

Introduction to ARDUINO, Architecture, overview of its I/O Ports, Serial Ports, PWM, ADC, Interfacing with different type of Sensors and Communication modules, Hardware timers, watchdogs and interrupt handling in Arduino. Controlling embedded system based devices using Arduino.

UNIT 3 ARM PROCESSOR BASED SoC and SoM

9 Hrs.

Overview of ARM 7 Architecture- Overview of Intel ARM based hard processor System on Chip (SoC) with an on chip FPGA - Overview of System on Module (SoM) using ARM based SoC- Fundamentals of ARM instructions, Barrel shifter, Classification and explanation of instructions with examples-Data processing, Branch, Load-store, SWI and Program Status Register instruction.

UNIT 4 EMBEDDED NETWORKING

9 Hrs.

Embedded Networking: Introduction, I/O Device Ports & Buses- multiple interrupts and interrupt service mechanism - Serial Bus communication protocols -RS232 standard-RS485-USB-Inter Integrated Circuits (I2C)- Serial Peripheral Interface (SPI) -CAN Bus -Wireless protocol based on Wifi , Bluetooth, Zigbee - Introduction to Device Drivers-Distributed Embedded system

UNIT 5 EMBEDDED SOFTWARE DEVELOPMENT TOOLS and REAL TIME OPERATING SYSTEM 9Hrs.

Introduction to assembler - Compiler -Cross compilers -Linker/ Locators - Simulators - RToS - Desktop OS versus RTOs - Software architectures - Round Robin, Round-Robin with Interrupts, Function Queue Scheduling architecture - ISRs and Scheduling -Task management - Task scheduling - Race conditions - Priority Inversion – Inter task Communication-Interprocess Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: VxWorks, uC/OS-II, RT Linux.

Max. 45 Hrs.



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New Course

COURSE OUTCOMES :

On completion of the course, student will be able to

CO1 - Analyze the architecture, functionalities of PIC 16F877A Microcontroller and apply for addressing the Engineering problems.

CO2 - Develop knowledge and skills required to develop an real time embedded system using ARDUINO for addressing Engineering problems

CO3 - Analyze the architecture of ARM processor and concepts of SoC and SoM. CO4

- Analyse the various standards and protocols used for embedded interfaces. CO5 -

Analyze various embedded software development tools.

CO6 - Evaluate the concept of RTOS in real time embedded system.

TEXT / REFERENCE BOOKS

1. Muhammed Ali Mazidi, Rolin D.Mckinlay, Dannycasuscy, "PIC microcontrollers and embedded systems using assembly and C", 1st edition, Pearson, 2007.
2. Rajesh Singh, Anita Gehlot, Bhupendra Singh, and Sushabhan Choudhury," Arduino-Based Embedded Systems, CRC Press; 1 edition, November 2017.
3. Ashwin Pajankar, ARDUINO MADE SIMPLE: With Interactive Projects, BPB Publications, 2018.
4. Raj Kamal, "Embedded system-Architecture, Programming, Design", Tata McGraw Hill, 2011.
5. Sriram. V. Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", 2004 Tata McGraw Hill Publishing Company Limited, 2006.
6. Frank Vahid, Tony Givargis, 'Embedded system Design - A unified Hardware / software Introduction', John Wiley and Sons, 2002.
7. Todd D Morton, 'Embedded Microcontrollers', Reprint by 2005, Low Price Edition.
8. Muhammed Ali Mazidi, Janice Gillispie Mazidi, 'The 8051 Microcontroller and Embedded Systems', Low Price Edition, Second Impression 2006.
9. <https://www.intel.com/content/dam/www/programmable/us/en/pdfs/literature/wp/wp-01167-custom-arm-soc.pdf>
10. <https://www.arm.com/resources/guide/designing-soc-with-cortex-m>
11. <https://www.microchip.com/design-centers/32-bit-mpus/sip-som/system-on-module>



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New Course

SECA2703	EMBEDDED AND DSP LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To impart knowledge in basic of embedded programming using AT89C51.
- To implement filters using MATLAB.
- To analyze the various application of embedded systems.
- To have a knowledge in DSP processor, TMS320C24X.

SUGGESTED LIST OF EXPERIMENTS EMBEDDED LAB

1. Basic illustration programs using arithmetic, Logical and bit-oriented instructions for AT89C51.
2. Interfacing light bulb using relay.
3. Interfacing LCD display in static display.
4. Interfacing stepper motor with ULN2003 to rotate in specific angle.
5. Interfacing DC motor with H-bridge to make it rotate in front, back, left, right.
6. Illustration of interrupts using LED on/off using timer delay.
7. Illustration of serial communication to transfer data from one microcontroller to other.

DSP LAB

The first subdivision programs had to be conducted using MATLAB and validated using manual calculation. The second subdivision has to be done in ALP programming using emulation.

(I) PROGRAMS USING MATLAB

1. Generation of Standard Signals.
2. Design of FIR filters using Windowing technique.
3. Design of IIR Filters using Butterworth filters.

(ii) USING TMS320CX2407 DSP Processor

1. Single pulse fixed PWM generation using general purpose Timers.
2. Two pulse fixed PWM generation using Timer 1 and Timer2.
3. Six pulse fixed PWM generation using full compare unit.
4. Six pulse fixed PWM generation with dead band.



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New Course

COURSE OUTCOMES

On completion of the course, student will be able to

CO1-Familiarize with the various basic operations using AT89C51.

CO2 - Explain the various signals using MATLAB.

CO3- Apply MATLAB to design a filter.

CO4- Examine the PWM pulse operation in DSP processor.

CO5- Evaluate the applications of embedded systems.

CO6- Design of microcontroller-based embedded systems.



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New Course

SEEA2702	EMBEDDED AND DSP LAB	L	T	P	Credits	Total Marks
		0	0	4	2	100

COURSE OBJECTIVES

- To impart knowledge in basic of embedded programming using PIC16F877.
- To analyze the various application of embedded systems using Arduino..
- To analyze the various application of embedded systems.
- To have a knowledge in DSP processor, TMS320C24X.

SUGGESTED LIST OF EXPERIMENTS EMBEDDED LAB

Using PICF877

1. Basic illustration programs for arithmetic operations using PIC16F877.
2. Basic illustration programs for logical operations using PIC16F877.
3. Interfacing LED.
4. Illustration of TIMER.
5. Interfacing of LDR .

Using Arduino

6. Interfacing LCD for display.
7. Interfacing of sensors.
8. Interfacing with the wireless communication modules
9. Design of Stepper Motor Control System
10. Design of Temperature Monitoring System Using RF Modem

Using ARM Processor

11. Program to interface relay card
12. Interface 4-digit seven-segment display to display any four letter word
13. Interfacing real time clock and serial port
14. Interface 2-line LCD module to output a moving message on it.
15. Implementing zigbee protocol with ARM.



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New Course

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Familiarize with the various basic operations using PIC16F877.

CO2 - Interface sensors and display units with microcontroller.

CO3 - Analyze the performance of TIMER and Interrupts.

CO4 - Design of microcontroller-based embedded systems.

CO5 - Understand the instruction set of 32 bit microcontroller ARM, and the software tool required for programming in Assembly and C language.

CO6 - Design ARM for a specific Application



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New Course

SEEA7016	Advanced Optimization Technique	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- Formulate complex optimization problems and choose appropriate solution methods.
- Understand the theoretical foundations of various advanced optimization techniques.
- Implement optimization algorithms and apply them to real-world problems.
- Analyze the performance and convergence of optimization algorithms

UNIT 1 INTRODUCTION

9 Hours

Introduction to Optimization- Types of optimization problems Real-world applications Concept of System and State- Performance Measure- Design Constraints- Condition for Optimality- Formulation of Objective Function-Classification of Optimization Problem Review of linear programming- Formulation of linear program- Feasible regions and solutions Simplex method and duality

UNIT 2 NONLINEAR OPTIMIZATION TECHNIQUES

9 Hours

Optimization Techniques- Single Variable and Multi-Variable Optimization Techniques and Unconstrained Minimization- Golden section- Random Pattern and Gradient Search Methods- Interpolation Methods- Optimization with Equality and Inequality Constraints- Direct Methods- Indirect Methods using Penalty Functions- Lagrange Multiplier Geometric Programming and Stochastic Programming-KKT Conditions-Derivation and significance

UNIT 3 GENETIC ALGORITHM

9 Hours

Introduction to Evolutionary Computing- Genetic Algorithm- Biological Inspiration -Finer Evaluation- Selection methods- Reproduction- Genetic Operators- Cross Over- Mutation- Schema Processing- Fitness Scaling Advanced Genetic Operators and Techniques in Genetic Search Constrained Genetic Algorithms- Penalty Functions- Multi Objective Optimization- Applications in Pattern Recognition Computers, Communication and Signal Processing.

UNIT 4 IMULATED ANNEALING

9 Hours

Simulated Annealing- Algorithm- Initial Solution- Assess Solution Randomly Tweak Solution- Acceptance Criteria- Temperature Schedule Adjusting Algorithm Parameters-Application

ANT COLONY OPTIMIZATION AND TABU SEARCH

9 Hours

Ant Colony Optimization - Ant Algorithm- Natural Motivation- Initial Population- Ant Movement- Ant Town- Pheromone Evaporation - Adjusting Algorithm Parameters- Alpha(α)/Beta(β)/ Rho(ρ)- Number of Ants- Applications- Routing- Shortest Term Problem. Tabu Search Principles- Short Term Memory- Long Term Memory- Tabu Thresholding- Special Dynamic Tabu Tenure Strategies- Hash Function.

45 Hours

COURSE OUTCOMES :

On completion of the course, student will be able to

CO1 - Comprehend the concepts of system and state, performance measures, design constraints, and conditions for optimality.

CO2 - Apply the simplex method and understand duality theory, including the dual simplex method, to solve linear programming problems.



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New Course

CO3 - Solve optimization problems with equality and inequality constraints using direct methods and penalty functions.
CO4 - Utilize advanced genetic operators, fitness scaling, and techniques for genetic search, including constrained genetic algorithms and penalty functions.
CO5 - Adjust algorithm parameters to optimize performance and apply simulated annealing to practical optimization problem.
CO6 - Master the principles of tabu search, including short-term and long-term memory, tabu thresholding, special dynamic tabu tenure strategies, and hash functions.



Insertion



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New Course

Text Book

1. Kalyonmoy Deb, "Optimization for Engineering Design", 2 nd Edition, Prentice Hall of India, 2012.
2. Pierre. D.A., "Optimization Theory with Applications", John Wiley, 1969.
3. Rao.S.S. "Optimization Theory and Applications", Wiley Eastern Ltd., 1979.
4. David.E.Goldberg, "Genetic Algorithms in Search, Optimization and Machine Learning", International Student Edition, Addison Wesley Ltd., 1999.
5. Fred Glover, Manuel Laguna, "Tabu Search", Kluwer Academic Publishers, 1997.
6. Tim Jones.M, "Artificial Intelligence Application Programming", Dreamtech Press, 2003, New Delhi.
7. Sin Giresu. S. Rao, "Engineering Optimization", John Wiley and Sons, 2009.
8. Frederick S. Hillier, Gerald J. Lieberman-"Introduction to Operations Research" by McGraw-Hill Education 2018



Insertion



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New Course

SEEA7017	SIMULATION OF POWER ELECTRONIC SYSTEMS	L	T	P	Credits	Total Marks
		3	*	0	3	100

COURSE OBJECTIVES

- Understand the Need and Challenges of Simulation.
- Develop and Analyze Mathematical Models.
- Simulate Systems Using SIMULINK.

UNIT 1 INTRODUCTION

9 Hours

Need for simulation - Challenges in simulation - Powerful simulation tools. -Overview of Pspice, MATLAB and SIMULINK. Mathematical Modeling of Power Electronic Systems: Static and dynamic models of power electronic switches - Develop static and dynamic models for power electronic switches, and formulate static and dynamic equations. Represent power electronic systems using state space methods.

UNIT 2 PSPICE

9Hours

File formats - Description of circuit elements - Circuit description - Output variables -Dot commands - SPICE models of Diode, Thyristors, Triac, BJT, Power MOSFET, IGBT and Power S-Functions - Converting SFunctions to blocks.

UNIT 3 MATLAB AND SIMULINK

9 Hours

MATLAB - Intro Variables - Matrix representation and operation, Trigonometric functions, Logical relations, Exponential Complex Numbers - m file - Function - For loop - While - If else. Create and customize 2D plots for data visualization. SIMULINK, including basic blocks, sources, and sinks. model analysis using SIMULINK - S-functions - converting S-functions to blocks.

UNIT 4 INTRODUCTION TO PSIM

9 Hours

General Information - Power Circuit Components - Control Circuit & Other Components- Analysis specification - Circuit Schematic Design - Waveform Processing - Error and Warning messages

UNIT 5 SIMULATION USING PSPICE, PSIM, MATLAB AND SIMULINK

9Hours

Diode rectifiers - controlled rectifiers - AC voltage controllers - DC choppers - PWM inverters - voltage source and current source inverters - Resonant pulse inverters - Zero current switching and zero voltage switching inverters.

45 Hours

COURSE OUTCOMES :

On completion of the course, student will be able to

CO1 - Comprehend the Importance and Applications of Simulation:

CO2 - Develop proficiency in using these tools for mathematical modeling and simulation.

CO3 - Formulate static and dynamic models for power electronic switches

CO4 Utilize PSPICE for Circuit Simulation.

CO5 - Implement MATLAB for Numerical Computations.

CO6 - Perform comprehensive model analysis and convert S-functions into SIMULINK blocks..



Insertion



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New Course

REFERENCES

1. Power Electronics: Converters, Applications, and Design -Ned Mohan, Tore M. Undeland, and William P. Robbins (Wiley, 2003)
2. SPICE for Power Electronics and Electric Power- Muhammad H. Rashid (CRC Press, 2019)
3. MATLAB for Engineers- Holly Moore (Pearson, 2020)
4. Simulink for Engineers- Olugbenga Omotayo (CRC Press, 2019)
5. PSpice for Circuit Theory and Electronic Devices- Paul Tobin (Pearson, 2016)
6. PSIM User Manual by Powersim Inc. serves



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1.	S14BLH21	Circuit Theory and Network Analysis	Skill Development
2.	SEEB2204	Electronic Devices Lab	Skill Development



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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Minutes of Board of Studies Meeting held on 25th Nov, 2023

Venue : Board Room, Ground Floor, School of EEE

- Dr. N.M. Nandhitha, Professor and Dean of the School of Electrical and Electronics, commenced the meeting and welcomed both internal and external attendees to the Board of Studies meeting scheduled for November 25th, 2023, from 10:30 a.m. to 12:00 p.m.
- Dr. S. Radhika, Head of the Department of Electrical and Electronics Engineering, informed the board that core competencies had been identified based on feedback from employers, instructors, alumni, and students.
- Dr. S. Radhika proposed changing the theory course SEEB1201 - Circuit Theory and Network Analysis to a Lab Heavy Course with an alternative subject code, S14LH21. This new lab-heavy course includes practice exercises for each unit.
- Dr. M.L. Bharathi recommended adding practice exercises on verifying Ohm's Law, series and parallel connections, and verifying Kirchhoff's Law in Unit I. She also suggested including analysis of AC circuits involving resistors (R), inductors (L), capacitors (C), RL, RC, and RLC circuits for both AC and DC excitation, along with appropriate practice exercises. The external member, Dr. N. Shivakumaran, Professor at NIT Tiruchirappalli, approved the modifications and proposed including application-oriented standard numerical problems in each unit.
- Dr. M. Kavitha proposed including practice exercises on network theorems with practical electrical applications in Unit III. Additionally, she recommended incorporating transient practice exercises for both DC and AC scenarios in Unit IV. Additionally, Dr. M.D. Selvaraj, an associate professor at IIITDM Kancheepuram, recommended that Unit V should include topics related to experiments based on network parameters.
- Dr. S. Radhika proposed changing the course SEEB2201 - Electrical Circuits and Electronic Devices Lab to SEEB2204 - Electronic Devices Lab. She also suggested including several simulation programs such as designing a voltage regulator circuit, implementing clippers and clampers using diodes, analyzing the frequency response of a CC amplifier, and studying TRIAC functionality.

External Members



Dr. N. Shivakumaran

Professor

Dept of I & C NIT, Trichy



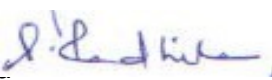
Dr, M. D. Selvaraj

Associate Professor,

IIITDM, Kancheepuram

The following internal and external members were present in the meeting

Internal Members

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3. Dr.S.Radhika 
4. Dr.D.Susitra
5. Dr.S.Nirmal Raj 
6. Dr.M.Kavitha 
7. Dr.P.Sivagami 
8. Dr.J.Barnabas Paul Gladly 
9. Mrs.D.Ramya 
10. Dr.V.Senthil Nayagam 
11. Dr.M.Pushpavalli 

SEEB1201	Circuit Theory and Network Analysis	L	T	P	EL	Credits	Total Marks
		3	1	0	0	3	100

COURSE OBJECTIVES

- To equip the students to analyze electrical circuits and networks
- To educate the phasor concepts in A.C circuits.
- To convey the knowledge of resonance and transients.

UNIT1 D.C. CIRCUITS

9 Hrs.

Electrical quantities, Ohm's Law, Resistors - Series and parallel combinations, Current Division rule, Voltage Division rule, Source transformation - Kirchhoff's laws, Nodal and Mesh Analysis, Star Delta Transformation.

UNIT2 SINGLE AND THREE PHASE AC CIRCUITS

9 Hrs.

Sinusoidal Functions - RMS(effective) and Average Values - Phasor Representation - J operator - Sinusoidal Excitation Applied to Purely Resistive - Inductive and Capacitive Circuits - RL - RC and RLC Series and Parallel Circuits- Power and Power Factor.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced

UNIT3 NETWORK THEOREMS (Only DC)

9 Hrs.

Superposition Theorem - Reciprocity Theorem - Thevenin's Theorem - Norton's Theorem - Maximum Power Transfer Theorem.

UNIT-4 NETWORK PARAMETERS

9 Hrs.

Network Parameters - Z,Y, h and ABCD- Conditions for Reciprocity - Parameter Conversion-Inter connection of Networks.

UNIT5 TRANSIENT ANALYSIS AND RESONANCE

9 Hrs.

Time Domain Analysis - Transient response of RL, RC & RLC Networks with DC Input and Sinusoidal AC input. Series and Parallel resonance - Quality factor and Bandwidth

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze dc circuits by different methods.

CO2 - Determine both magnitude and phase angle for various parameters of AC circuits.

CO3 -Apply Electrical theorems to solve complex electrical circuits.

CO4-Determine the various parameters for electrical circuits.

CO5- Analyze and interpret the transient response characteristics of electrical circuits. CO6-

Create resonance in AC circuits.



Insertion



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New Course

TEXT / REFERENCE BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis)", Dhanpat Rai & Sons, New Delhi, 2020.
3. Joseph A. Edminister, Mahmood Nahvi, "Electric circuits", Schaum's series, McGraw-Hill, First Edition, 2019.
4. Mittle B.N., Aravind Mittle, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition, July 2017.
5. Charles Alexander, Mathew Sadiku, "Fundamentals of Electric Circuits", Tata McGraw Hill, 6th Edition, 2017.
6. Smarajit Ghosh, "Fundamentals of Electrical and Electronics Engineering", PHI Learning Private Ltd, 2nd Edition, 2010.
7. Abhijit Chakrabarti, Sudiptanath & Chandan Kumar Chanda, "Basic Electrical Engineering", Tata McGraw Hill, 1st Edition, 2010.
8. Wadhwa C.L., "Basic Electrical Engineering", New Age International, 4th Edition, 2007, Reprint June 2010.



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New Course

S14BLH21	CIRCUIT THEORY AND NETWORK ANALYSIS	L	T	P	EL	Credits	Total Marks
		2	0	2	0	4	100

COURSE OBJECTIVES

- To equip the students to analyze electrical circuits and networks
- To educate the phasor concepts in A.C circuits.
- To convey the knowledge of resonance and transients.

UNIT 1 D.C.CIRCUITS

9 Hrs.

Electrical quantities, Ohm's Law, Resistors - Series and parallel combinations, Current Division rule, Voltage Division rule, Source transformation - Kirchhoff's laws, Nodal and Mesh Analysis, Star Delta Transformation. Analysis and Experimental Verification of Kirchhoff's Law.

Practice Exercise:

Verification of Ohm's Law - To verify Ohm's Law, $V = IR$, using different resistors and measuring the voltage across them and the current through them

Series and Parallel Combinations of Resistors - To study the behavior of resistors in series and parallel configurations

Verification of Kirchhoff's Laws- To experimentally verify Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL).

UNIT 2 SINGLE AND THREE PHASE AC CIRCUITS

9 Hrs.

Sinusoidal Functions - RMS(effective) and Average Values - Phasor Representation - J operator - Sinusoidal Excitation Applied to Purely Resistive - Inductive and Capacitive Circuits - RL - RC and RLC Series and Parallel Circuits- Power and Power Factor.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced. Experimental Verification and comparison of Series and Parallel A.C circuits, Series and Parallel Resonance

Practice Exercise:

To analyze AC circuits with resistive, inductive, and capacitive elements. To analyze and compare RL, RC, and RLC circuits under AC excitation. To experimentally verify and compare series and parallel AC circuits.

UNIT 3 NETWORK THEOREMS (Both AC and DC)

9 Hrs.

Superposition Theorem - Reciprocity Theorem - Thevenin's Theorem - Norton's Theorem - Maximum Power Transfer Theorem. Theoretical and Experimental Verification of Theorems.

Practice Exercise:

To verify the Superposition Theorem experimentally

To experimentally verify the Reciprocity Theorem

To determine and verify Thevenin's equivalent circuit experimentally

To determine and verify Norton's equivalent circuit experimentally

To experimentally verify the Maximum Power Transfer Theorem.



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New Course

UNIT 4 TRANSIENT ANALYSIS AND RESONANCE

9 Hrs.

Time Domain Analysis - Transient response of RL, RC & RLC Networks with DC Input and Sinusoidal AC input. Series and Parallel resonance - Quality factor and Bandwidth. Apply steady state analysis to R-L and R-C circuits with DC transients.

Practice Exercise:

To study and compare the transient response of RL, RC, and RLC circuits with a DC input.

To study and compare the transient response of RL, RC, and RLC circuits with a sinusoidal AC input.

To determine resonance frequency, quality factor, and bandwidth of series and parallel resonant circuits.

UNIT 5 NETWORK PARAMETERS

9 Hrs.

Network Parameters - Z, Y, h and ABCD- Conditions for Reciprocity - Parameter Conversion-Inter connection of Networks. Design of circuits using network parameter for solving real world problems.

Practice Exercise:

To measure and calculate Z (impedance), Y (admittance), h (hybrid), and ABCD (chain) parameters of passive linear networks.

To verify conditions for reciprocity in network parameters.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to.

CO1 - Analyze dc circuits by different methods.

CO2 - Determine both magnitude and phase angle for various parameters of AC circuits.

CO3 -Apply Electrical theorems to solve complex electrical circuits.

CO4 -Analyze and interpret the transient response characteristics of electrical circuits.

CO5 - Determine the various network parameters for electrical circuits

CO6 -Design circuits for practical applications.

TEXT / REFERENCE BOOKS

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, 9th edition, New Delhi, 2020.
2. Chakrabarti A, "Circuits Theory (Analysis and synthesis)", Dhanpat Rai & Sons, New Delhi, 2020.
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New Course

SEEB2201	Electrical Circuits and Electronic Devices Lab	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To know the usage of Electrical and Electronic equipment.
- To know the testing of components.
- To understand the transient and resonance circuits.
- To understand the PN diode operation in forward and reverse bias.
- To know the characteristics of transistor in CB, CE configurations

SUGGESTED LIST OF EXPERIMENTS

Electrical Circuits Lab

1. Verification of Kirchoff's Law.
2. Verification of Theorems.
3. Series and Parallel A.C circuits.
4. R-L and R-C transients with DC transients.
5. Series and Parallel Resonance.
6. Clippers and Clampers.

Electronic Devices Lab

1. Characteristics of Semiconductor diode and Zener diode to find static and dynamic resistance from the characteristics.
2. Characteristics of CB configuration.
3. Characteristics of CE configuration.
4. Drain and transfer characteristics of JFET. To obtain gain, trans conductance and amplification factor.
5. Characteristics of SCR, find holding current, break over voltage and holding voltage.
6. Characteristics of UJT, find intrinsic standoff ratio, Peak voltage and valley voltage.
7. Characteristics of LDR with illumination and without illumination.
8. Voltage multipliers.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Generate waveforms using function generator and measure voltage, frequency and phase of any waveform using CRO.

CO2 - Use various electrical components to verify Kirchoff's Law.

CO3 - Apply laws to verify various theorems.

CO4 - Analyze the performance of transients and resonance circuits.

CO5 - Analyze the characteristics of different electrical and electronic devices such as diodes, transistors etc.

CO6 - Design and verify the characteristics of different electronic circuits like rectifiers, amplifiers etc.



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New Course

SEEB2204	ELECTRONIC DEVICES LAB	L	T	P	EL	Credits	Total Marks
		0	0	4	0	2	100

COURSE OBJECTIVES

- To know the usage of Electrical and Electronic equipment.
- To know the testing of components.
- To understand the transient and resonance circuits.
- To understand the PN diode operation in forward and reverse bias.
- To know the characteristics of transistor in CB, CE configurations.

SUGGESTED LIST OF EXPERIMENTS

1. Characteristics of pn junction diode to find static and dynamic resistance from the characteristics.
2. Characteristics of Zener diode to find static and dynamic resistance from the characteristics.
2. Characteristics of CB configuration.
3. Characteristics of CE configuration.
4. Drain and transfer characteristics of JFET. To obtain gain, trans conductance and amplification factor.
5. Characteristics of SCR, find holding current, break over voltage and holding voltage.
6. Characteristics of UJT, find intrinsic standoff ratio, Peak voltage and valley voltage.
7. Characteristics of LDR with illumination and without illumination.
8. Voltage multipliers.

Simulation experiments.

1. Design voltage regulator circuit using diodes.
2. Design Clippers and Clampers circuit using diodes.
3. To analyze the frequency response of CC amplifier.
4. To design and analyze ac voltage control circuit using TRIAC.

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Analyze the characteristics of different electronic devices such as diodes, transistors..
- CO2 - Analyze the various circuit configurations and its classifications of MOSFETs
- CO3 - Analyze the performance of transients and resonance circuits.
- CO5 - Analyze the characteristics of special semiconductor devices.
- CO6 - Design electronic circuits for various applications



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New Course