Bansilal Ramnath Agarwal Charitable Trust’s

Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of
T.Y. B.Tech. (Electronics Engineering)

Pattern ‘F-11 Revised’
Academic Year 2015-16

Prepared by: - Board of Studies in Electronics Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by

Chairman – BOS  Chairman – Academic Board
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**Based on Digital Electronics and Data Structure & Algorithms**
### S.Y. B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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#### S.Y. B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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* ONLY FOR SECOND YEAR DIRECT ADMITTED STUDENTS
**T.Y. B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15**

**Module 5**

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*** Based on Microcontroller & Applications and Digital Signal Processing
## T.Y. B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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**** Based on Power Electronics and Digital Integrated Circuits
## T.Y. B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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### Final Year B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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#### Final Year B.Tech Electronics Engineering Structure with effect from Academic Year 2014-15

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EC30101: MICROCONTROLLER AND APPLICATIONS

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Unit I

(8 Hrs)
INTRODUCTION TO MICROCONTROLLER

A. Microprocessor and microcontroller, Features and architecture of 89C51 microcontroller, Addressing modes, Instruction set.

B. Features and architecture of 89V51RD2 microcontroller.

Unit II

(8 Hrs)
ON CHIP PERIPHERALS OF 89C51

A. Port structure, Timers and counters, Serial port, Interrupt structure and simple assembly language programs

B. On chip peripherals of 89V51RD2( PCA with PWM, Timers and counters, Interrupts etc)

Unit III

(8 Hrs)
SERIAL AND PARALLEL PORT INTERFACING

A. Interfacing of display devices like LED, Seven segment, 2 x 16 character LCD (8bit mode), serial communication protocols-RS232, RS485, Buses-I2C and its implementation, SPI.

B. Interfacing of 2 x 16 character LCD in 4 bit mode, alphanumeric display

Unit IV

(8 Hrs)
INTERFACING AND PROGRAMMING USING EMBEDDED C

A. 4 X 4 matrix keypad, DAC( Binary weighted and R2R ladder), ADC(Dual slope and Successive approximation type), Stepper motor( Unipolar, permanent magnet)

B. Interfacing of relay, temperature sensor, DC & servo motor.
Unit V
RISC MICROCONTROLLERS

A. Memory interfacing, Features and Architecture of PIC 16F877A and AVR Atmega32, Theoretical minimum system design.

B. Instruction set of PIC 16F877A

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<tr>
<td>2. ‘8051 microcontroller Architecture, programming and Applications- Kenath Ayala, third edition, Peneram publication</td>
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<td>1. Datasheets of 89C51RD2, ADC 0809, DAC 0808, PIC 16F877A, AVR Atmega32, PCF 8591</td>
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<td>2. ‘Serial port complete’- Jan Axelson, Peneram publication</td>
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Course Outcomes:
The student will be able to

1. Write the assembly language and C-language programs for Intel 8051 microcontroller.
2. Interface input/output peripherals to 8051 family microcontroller.
3. Explain communication protocols.
4. Design 8051 based minimum system for a specific application.
5. Apply the concepts of Intel 8051 microcontroller in learning any latest controller technology.
Laboratory Course Syllabus

EC 30306: MICROCONTROLLER AND APPLICATIONS

Credits: 1  
Teaching Scheme: - Laboratory 2 Hrs/Week

List of practicals

1. Study of simulator, assembler and cross-compiler for 8051 family microcontroller.
2. Unsigned and Signed arithmetic operations using simulator
3. LED interfacing
4. Seven segment display interfacing
5. 2 X 16 character LCD interfacing
6. Serial communication
7. 4 X 4 keypad matrix interfacing
8. DAC interfacing
9. ADC interfacing
10. Stepper motor interfacing

Text Books
3. ‘8051 and Embedded C programming’- Mazidi and Mazidi, Second edition, Pearson education
4. ‘8051 microcontroller Architecture, programming and Applications- Kenath Ayala, third edition, Peneram publication

References
3. Datasheets of 89C51RD2, ADC 0809,DAC 0808, PIC 16F877A, AVR Atmega32, PCF 8591
4. ‘Serial port complete’- Jan Axelson, Peneram publication

Course Outcomes:
The student will be able to-
1. Program 8051 family microcontrollers using integrated development environment.
2. Interface input/output peripherals to 8051 family microcontrollers.
3. Estimate hardware and software requirements of microcontroller based system.
Tutorial Course Syllabus

<table>
<thead>
<tr>
<th>MICROCONTROLLER AND APPLICATIONS</th>
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</thead>
<tbody>
<tr>
<td>Credits: 1</td>
</tr>
</tbody>
</table>

List of Tutorials

1. Study of addressing modes
2. Brief discussion on 8051 instruction set
3. Assembly language program for multibyte addition.
4. Assembly language program for block transfer.
5. Assembly language program of code conversion.
6. Assembly language program to find Largest/smallest number from a given array
7. Event counter using 8051 timer.
8. PWM generation
9. Interrupt programming
10. Implementation of I2C/SPI protocol.
11. Assembly language program for interfacing switch & LED to PIC 16F877A.
12. Assembly language program to read/write PIC 16F877A on-chip EEPROM.

Text Books

5. ‘8051 and Embedded C programming’- Mazidi and Mazidi, Second edition, Pearson education
6. ‘8051 microcontroller Architecture, programming and Applications- Kenath Ayala, third edition, Peneram publication

References

5. Datasheets of 89C51RD2, ADC 0809, DAC 0808, PIC 16F877A, AVR Atmega32, PCF 8591
6. ‘Serial port complete’- Jan Axelson, Peneram publication
**Theory Course Syllabus**

**EC30102 : DIGITAL COMMUNICATION**

<table>
<thead>
<tr>
<th>Unit I</th>
<th>Sampling &amp; Waveform Coding</th>
<th>(8 Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Introduction to digital communication, Sampling, reconstruction, ideal sampling, Flat top &amp; Natural Sampling Aliasing, Aperture effect. Pulse code modulation &amp; reconstruction, Quantization noise, Companded PCM, Delta modulation, Adaptive delta modulation, Differential PCM, ISI and eye diagram.</td>
<td></td>
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<tr>
<td>B. LPC and Line Coding, equalizers.</td>
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<table>
<thead>
<tr>
<th>Unit II</th>
<th>Digital modulation techniques</th>
<th>(8 Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Digital modulation techniques such as Binary Phase Shift Keying, Quadrature Phase Shift Keying, M-Ary PSK, Quadrature Amplitude Shift Keying, Binary Frequency Shift Keying, M-Ary Frequency Shift Keying, Minimum Shift Keying</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Differential Phase Shift Keying, Differentially encoded PSK, Gaussian Minimum Shift Keying.</td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit III</th>
<th>Detection &amp; Performance Analysis Of Digital Signal</th>
<th>(8 Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Base Band signal receiver, Derivation for Error prob of int. &amp; dump Filter, Optimum Filter, white noise matched filter, probability error of match filter, correlation, FSK, PSK, non-coherent detection of FSK, DPSK, QPSK, Calculation of error probability for BPSK &amp; BFSK, Signal Space to calculate Probability of error.</td>
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<tr>
<td>B. Correlator receiver.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit IV</th>
<th>Spread Spectrum</th>
<th>(8 Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Pseudo-random Sequence, Direct Sequence Spread Spectrum Phase Shift Keying block details &amp; mathematical treatment, Power Spectrum Density curves, Jamming margin and processing gain, Probability of error, Frequency Hop Spread Spectrum.</td>
<td></td>
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<tr>
<td>B. Tracking &amp; Acquisitions of DS &amp; FH systems, applications of DSSSSPSK and FHSS.</td>
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<table>
<thead>
<tr>
<th>Unit V</th>
<th>Introduction to Link Design and Link Budget Analysis</th>
<th>(8 Hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. CDMA, TDMA, FDMA, Kepler’s Laws, Satellite orbits, Satellite system link models, Free Space Propagation, System Noise, Transmission losses, Carrier to noise ratio for uplink &amp;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Downlink, Energy-Per-Bit to Noise Density, combined Carrier to noise ratio, Interference for uplink & Downlink, link budget.

B. Interference between Satellite circuits, Error Control Coding for Satellites & link Parameters Affected by Coding.

<table>
<thead>
<tr>
<th>Text Books</th>
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<table>
<thead>
<tr>
<th>Reference Books</th>
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</thead>
</table>

**Course Outcomes:**

Student will be able to

1. Encode analog signals in digital formats.
2. Analyze modulation techniques with respect to bandwidth, Euclidian distance and probability of error.
3. Evaluate performance of matched filter and correlator in comparison with optimum receiver.
4. Describe spread spectrum system.
Laboratory Course Syllabus

EC 30308 : DIGITAL COMMUNICATION

Credits: 01  
Teaching Scheme: - Practical 2 Hrs/Week

List of Practicals

1. Verification of sampling theorem and understanding Natural & Flat Top Sampling.
2. Study of Pulse code Modulation.
3. Spectral analysis of line codes.
4. Study pf PCM A-law with noise measurements
5. Generation & detection DM, ADM with Noise measurements.
7. Generation & detection of BFSK.
8. Generation & Spectral analysis of PN sequence.
10. Simulation of PSK system using MATLAB & Simulink

Text Books


Reference Books


Course Outcomes:

Student will be able to
1. Analyze digital encoding circuits.
2. Apply modulation techniques for digital communication.
3. Perform spectral analysis.
4. Simulate and evaluate performance of different digital modulation techniques.
DIGITAL COMMUNICATION

| Credits: 01 | Teaching Scheme: - Tutorial 1 Hrs/Week |

List of topics

1. Fourier Series, Fourier Transform & PSD
2. Sampling
3. Pulse Code Modulation
5. BPSK, QPSK & M-ary PSK.
6. QAM, BFSK & MSK
7. Probability of Error of integrator & Dump filter, Matched Filter, Correlator
8. Probability of Error of BPSK, QPSK, BFSK based on Euclidian distance
9. Generation of PN sequence, Properties
10. Probability of Error of DSSS system, Processing Gain & Jamming Margin
11. Link Budget Analysis - Flux density, Received Power
12. Link Budget Analysis – C/N ratio, Budget

Text Books

Reference Books
EC 30103 : DIGITAL SIGNAL PROCESSING

Credits: 03
Teaching Scheme: - Theory 3 Hrs/Week

Unit I :
Z Transform
B. Sampling process, Convolution and Correlation

Unit II :
Discrete Fourier Transform
A. Discrete time Fourier transform (DTFT), Discrete Fourier transform (DFT), Relation of DFT to other transforms, Properties of DFT, Overlap_add and overlap_save methods.
B. Applications of DFT

Unit III :
FFT Algorithms
FFT algorithms - Decimation in Time and Decimation in frequency, IDFT using FFT, Quantization errors in DFT and FFT.
B. Goertzel algorithm

Unit IV :
FIR Filters
B. Design of FIR filters using Fourier series method, applications of FIR filters

Unit V :
IIR Filters
A. IIR filter structures - Direct form, Parallel form, cascade structure. IIR Filter design methods - Bilinear transformation, Impulse invariance; Finite word length effects in IIR filters.
B. IIR Filter design by Approximation of Derivatives.

Text Books
Reference Books


Course Outcomes:

Student will be able to-
1. Analyze LTI systems using Z-transform.
2. Demonstrate use of DFT in analyzing LTI systems.
3. Determine DFT coefficients using FFT algorithms to minimize hardware complexity.
4. Design and analyze FIR and IIR filters for the given Specifications.
EC30307 : DIGITAL SIGNAL PROCESSING

List of Practicals

1. Study of basic signals
2. Verification of sampling theorem
3. Rational-Z transform
4. DTFT - Magnitude and Phase spectrum plot
5. DFT - Magnitude and Phase spectrum plot
6. Linear filtering of long data sequence
7. DIT FFT algorithm
8. Design and implementation of FIR filter using Window Technique
9. Design and implementation of IIR filter
10. Finite word length effect in IIR filter

Text Books
1. Digital Signal Processing, Proakis, Manolakis, Pearson and PH, 3rd edition

Course Outcomes:

Student will be able to
1. Simulate Discrete Time signals.
2. Determine stability and causality of LTI systems from pole zero plot.
3. Apply properties of DFT to LTI systems.
4. Determine FFT coefficients.
5. Implement FIR and IIR filters for the given specifications.
Theory Course Syllabus

UNIT I: Synchronous Sequential Machines  
Part A
Mealy Machine, Moore Machine, State Equivalence, Machine Minimization, ASM and Basic principles, Synchronizer failure and Meta-stability, Practical Issues such as Clock Jitter and Skew.

Part B
Examples based on minimization techniques

UNIT II: Asynchronous Sequential Machines  
Part A

Part B
Examples based on asynchronous sequential machines

UNIT III: Logic Families  
Part A
Classification of Logic Families: TTL, CMOS, ECL, RTL, I2L and DCTL, Characteristics of Digital ICs: Speed of Operation, Power Dissipation, Figure of Merit, Fan in, Fan out, Current and Voltage Parameters, Noise Immunity, Operating Temperatures and Power Supply Requirements, TTL: Operation of TTL NAND gate, Active pull up, Wired AND, Open Collector Output, Tri-State logic, Interfacing CMOS and TTL.

Part B
Comparison of logic families.

UNIT IV: Building Block Design  
Part A
Floating-Point Encoder, Dual-Priority Encoder, Comparator, Adder- Single Bit Adder, Bit

Part B
Synchronizers and Arbiters.

Unit V: Fault Diagnosis and Testing (8 Hrs)

Part A
Fault Diagnosis, Fault Table Method, and Fault Model: Stuck at Model, Path Sensitization Method, Built in Scan Test.

Part B
Built in Logic Block Observer

TEXT BOOKS:

REFERENCE BOOKS:

Course Outcomes:

The student will be able to –

1. Design synchronous logic circuits.
2. Analyze asynchronous logic circuits.
3. Compare different logic families.
4. Apply combinational logic building blocks in digital applications.
5. Carry out fault diagnosis of digital circuits.
Theory Course Syllabus

EC31102: COMPUTER ARCHITECTURE AND OPERATING SYSTEM

Credits: 02  
Teaching Scheme: - Theory 2 Hrs/Week

Unit I (5 Hrs)
Structure of a Computer System & Processor Organization
A. Brief History of computers, Von Neumann Architecture, Functional Units, Data Types and Computer Arithmetic: Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2’s Complement arithmetic, multiplication.
B. IEEE standards for Floating point representations.

Unit II (5 Hrs)
Control Unit & I/O Organization
A. CPU Architecture (8086), Register Organization, Instruction types, Instruction formats, Instruction cycles, Types of operands, Addressing Modes, Single Bus CPU, Control Unit Operation: Instruction Sequencing, Micro-operations. Hardwired Control: Multiplier CU.
B. Applications of microprogramming, I/O channels

Unit III (5 Hrs)
Introduction to OS & Process Management
B. Producer Consumer Problem, Dining Philosopher problem.

Unit IV (5 Hrs)
Deadlock and CPU Scheduling
B. Multi Processor Scheduling, Real Time Operating System.

Unit V (6 Hrs)
Memory Management

A. Memory management requirements, Memory partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit and Worst Fit), Fragmentation, and Swapping. Virtual Memory Concepts, Segmentation, Paging, Page Replacement Policies (FIFO, LRU, Optimal), Thrashing.

B. Demand paging, Cache Memory

Text Books


Reference Books


Course Outcomes:

Student will be able to

1. Describe various functional units of computer systems.
2. Perform arithmetic operations on fixed and floating point numbers.
3. Explain architecture of 8086.
4. Identify role of operating system in computers.
5. Explain process management and memory management.
Project Course Syllabus

EC37403: Miniproject

Credits: 2

Teaching Scheme: 4 Hours / Week

Guidelines:

1. Mini Project will be based on all subjects of that Semester except GP. It is applicable to Semester I irrespective of module (5 or 6).

2. The Semester Mini Project will be for a group of 3 to 5 students. Head of Department to appoint Mini Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.

3. Group formation, discussion with faculty advisor/guide, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

4. The Assessment Scheme will be:

   (a) **Continuous Assessment 50 marks** *(based on regular interaction, circuit development)*
   
   (b) **End Semester 50 marks** *(based on implementation, testing, results, poster presentation, and demonstration)*

Course Outcomes:

The student will be able to

1. Planning and implementation of hardware/software project
2. Prepare the budget for hardware requirement
3. Demonstrate the project.
4. Work as a team member.
Project Course Syllabus

EC37302: Major Project I

Credits: 2  
Teaching Scheme: 2 Hours / Week

Guidelines:

1. The project work should be carried out by a group of three to four students.
2. The project topic should be finalized with the consent of Project Guide in stage-I after carrying out literature survey/study in the related area. Its implementation can be carried out in stage II and stage III.
3. Interdisciplinary project topic, if any, can be selected with the consent of the guide and coordinating committees of respective disciplines.
4. For the sponsored project, students should submit the approval by the respective industry.
5. A logbook should be maintained by the group throughout all the three Project stages containing the details of work done, problems faced, solutions evolved etc. and should be duly signed by the Internal and/or External guide on regular intervals.
6. Both the Project progress review reports for this stage should be submitted in the prescribed format only after approval from the guide.
7. Abstract of the project should be submitted in the prescribed format at the time of Stage-1 evaluation.

Course Outcomes:

The student will be able to

1) Identify the area for project work through literature survey.
2) Plan the project activity with the constraints required to implement it.
3) Develop communication and presentation skill.
4) Work as team member for core/multidisciplinary projects.
Seminar Course Syllabus

EC 37301: Technical Seminar

Credits: 2

Teaching Scheme: - Lab 4 Hrs/Week

Guidelines:

- It is applicable to semester II irrespective of module (5 or 6).
- A seminar based on relevant disciplinary or inter disciplinary topic is to be presented by every candidate during the semester. It consists of Literature Survey, study of system and analysis.
- The selection of the topic should be based on references from magazines, transactions, reference books and other technical literature.
- The approval of the Department Head/ Coordinator prior to commencement of work and presentation is essential.(ISO registration form FF105 is to be filled.)
- The seminar progress is reviewed during the semester. In the reviews the applicability and the relevance of the topic etc. is discussed.
- The student is expected to produce a report based on the work carried out. The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.
- Guidelines for evaluation of seminar:-
  1. Timely submission of abstract – 10%
  2. Literature review – 10%
  3. Regular reporting during semester - 10%
  4. Attendance during seminar presentation – self and peer – 10%
  5. Relevance of seminar topic – 10%
  6. Technical contents – 10%
  7. Presentation – 25%
  8. Questions and answer session – 15%

Course outcomes:

Upon completion of this course students will be able to

1. Identify the area for seminar through literature survey.
2. Enhance presentation skill and technical writing
3. Develop good communication skill.
4. Develop research attributes (essential for major project activity)
EC30104: ELECTROMAGNETIC ENGINEERING

| Credits: 03 | Teaching Scheme: - Theory 3 Hrs/Week |

Unit I  
Vectors and Coordinate Systems  
(4 Hrs)

A. Addition, subtraction, dot product and vector product of vectors, unit vectors, position and displacement vectors, Cartesian, cylindrical and spherical coordinate systems

B. Co-ordinate Conversions: Cartesian to Spherical and Cylindrical etc.

Unit II  
Electrostatics  
(10 Hrs)

A. Coulomb’s Law, Concept of Electric Field intensity, Electric Field Intensity due to various charge distributions, Gauss’s law and its applications, Divergence theorem, Work, Energy, Potential, Gradient, Electric Fields in conductors and dielectrics, Continuity Equation, Boundary Conditions

B. Laplace, Poisson’s equations

Unit III  
Magnetic Field  
(10 Hrs)

A. Biot Savart law, Magnetic Field Intensity due to various current distributions, Ampere’s circuital law and its applications, Curl, Stokes’ theorem, Magnetic Flux and magnetic flux density, Scalar and vector magnetic potentials, Forces due to magnetic fields, Magnetization and Permeability, Boundary conditions, Magnetic Energy

B. Magnetic circuits, Inductance and Mutual Inductance.

Unit IV  
Maxwell’s Equations & Time Varying Fields  
(8 Hrs)

A. Faraday’s law, Displacement current, Maxwell’s equations, Time varying fields, Time harmonic fields, Energy stored in electric and magnetic time varying field

B. Retarded potentials
Unit V  
Uniform Plane Wave And Propagation  
(8 Hrs)

A. Wave equation, Wave propagation in free space, dielectrics and conductors, Skin Effect, Polarization, Reflection of uniform plane waves at normal and oblique incidence, Standing wave ratio, Wave reflection from multiple interfaces

B. Wave propagation in dispersive media

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Course Outcomes:

The student will able to

1. Represent vectors in cartesian, cylindrical and spherical coordinate system.
2. Calculate electric and magnetic field produced by line, surface and volume charge distribution.
3. Calculate time varying electric and magnetic field using Maxwell’s equation (EMI, EMC).
4. Analyze the behavior of electromagnetic wave in conductor, dielectric, lossy and lossless medium.
EC30203: ELECTROMAGNETIC ENGINEERING

Credits: 01
Teaching Scheme: - Tutorial 1 Hrs/Week

Contents

1. Coordinate Systems
2. Coulomb’s Law
3. Gauss’ Law
4. Work, Energy, Potential
5. Boundary Conditions
6. Ampere’s Law
7. Magnetization and Boundary Conditions
8. Maxwell’s Equation and Wave Equation
9. Polarization
10. Wave reflection (normal incidence)
11. Wave reflection (oblique incidence)
12. VSWR

Text Books


Reference Books

UNIT I Feedback Amplifiers and Oscillators (8Hrs)


B. LC Oscillators, Crystal Oscillator

UNIT II Large Signal AF Power Amplifiers (6 Hrs)

A. Classes of power amplifiers - Class A, Class B, Class AB, Class C, Class D. Class A with resistive load, Transformer coupled class A amplifier, Class B & Class AB Push-pull and Complementary symmetry amplifiers, Efficiency analysis for all, Comparison of efficiencies.

B. Distortions in amplifiers, Total Harmonic Distortion (THD).

UNIT III OP-AMP Fundamentals (9 Hrs)

A. Basic building blocks of operational amplifier, Differential amplifier, Current sources like Constant Current Source, I-Mirror, Widlar Current Source, Active level shifters, Output stage, Open loop and Closed loop operation, Inverting and non-inverting configurations of op-amp, Concept of virtual short and virtual ground. Ideal op-amp parameters like input offset voltage, Output offset voltage, Input offset current, Input bias current, CMRR, PSRR, Slew rate, Open loop gain, Input resistance, Output resistance, Frequency response, Small signal and Power bandwidth, Non-ideal op-amp behavior in terms of ac and dc parameters and its effect on performance, Offset null techniques.

B. Wilson Current Source, Frequency Compensation

UNIT IV Linear Applications of OP-AMP (9Hrs)

A. Summing amplifier, Difference amplifier, Voltage follower, Ideal and practical Integrator, Integrator set, run and hold modes, Ideal and practical Differentiator, Voltage to current converters with floating load & grounded load and its applications, Current to voltage converters and its applications, Log Amplifier with log ratio and temperature compensation circuits.
B. Instrumentation amplifier, Antilog amplifier

Unit V

Non Linear Applications of OP-AMP

A. Precision half wave and full wave rectifiers, Comparators, Limitations of op-amp as comparator, Window Comparator, Schmitt Trigger with and without reference voltage, Astable multivibrator, Monostable Multivibrator, Design of square, triangular, pulse and saw tooth waveform generators.

B. Peak Detectors, Sample and Hold circuits

Text Books
1. Integrated Electronics, Millman Halkias, Tata McGraw Hill.
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, TMH, Third edition
3. Op-amp and Integrated Circuits, Ramakant Gayakwad, PHI

Reference Books
3. Opearational Amplifiers and Linear Integrated Circuits, Coughlin, Discroll, PHI

Course Outcomes:

The Student will be able to
1. Analyze feedback amplifier circuits and oscillator circuits.
2. Classify power amplifier circuits with respect to its parameters.
3. Explain internal blocks of op-amp and its parameters.
4. Design linear applications of op-amp.
5. Evaluate non-linear applications of op-amp.
Laboratory Course Syllabus

EC30303: ANALOG CIRCUITS

Credits: 01
Teaching Scheme: Laboratory
Hrs/Week.

List of Practical

1. Series Feedback Amplifier
2. Shunt Feedback Amplifier
3. Wien Bridge Oscillator
4. Complementary Symmetry Power Amplifier
5. Op-amp Parameters
6. Design and testing of Integrator and Differentiator Circuit
7. Design and testing of V to I & I to V Converters
8. Design and testing of Comparator and Schmitt Trigger
9. Design and testing of Precision Half Wave and Full Wave Rectifier
10. Design and testing of Waveform Generator

Text Books
1. Integrated Electronics, Millman Halkias, Tata McGraw Hill.
2. Design with Operational Amplifiers and Analog Integrated Circuits, Sergio Franco, TMH, Third edition
3. Op-amp and Integrated Circuits, Ramakant Gayakwad, PHI

Reference Books
3. Opearational Amplifiers and Linear Integrated Circuits, Coughlin, Discroll, PHI

Course Outcomes:

The student will be able to

1. Construct feedback amplifier circuits.
2. Compare power amplifier circuits.
3. Measure op-amp parameters
4. Design and test circuits for linear applications of op-amp.
5. Build and test circuits for non-linear applications of op-amp.
**Tutorial Course Syllabus**

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<th>ANALOG CIRCUITS</th>
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<td><strong>Teaching Scheme:</strong> - - Tutorial 1 Hr/Week</td>
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**List of Contents**

1. Feedback amplifiers  
2. Feedback amplifiers  
3. Oscillators  
4. Power amplifiers  
5. Power Amplifiers  
6. Opamp parameters  
7. Opamp parameters  
8. Instrumentation Amplifiers  
9. Log Amplifier  
10. Multivibrators  
11. IC 555  
12. IC 555

**Text Books**

1. Integrated Electronics , Millman Halkias , Tata McGraw Hilll.  
2. Design with operational amplifiers and analog integrated circuits ,Sergio Franco, TMH, Third edition  
3. Op- amp and Integrated Circuits, Ramakant Gayakwad, PHI
EC30106: POWER ELECTRONICS

Credits: 03  Teaching Scheme: - Theory 3 Hrs/Week

Unit I (10+1 Hrs)
POWER DEVICES

A. Structural modifications for power devices.  
Structure, Characteristics, ratings of Power Diode SCR, GTO, IGBT  
Comparison of above devices with Power MOSFET & Power BJT  
Driver Circuits (isolated & non-isolated) for IGBT & SCR  
Commutation circuits for SCR  
Protection circuits for IGBT & SCR  
B. Comparison of all power devices and suitability for applications.  
Silicon Carbide (SiC), Gallium Nitride (GaN)-based power devices. Suitability of these devices for high power circuits.

Unit II (8+1 Hrs)
CONTROLLED RECTIFIER

A. Concept of line commutation.  
Single-phase half wave and full wave controlled rectifier: Circuit diagram, operation, waveforms for resistive and level (highly inductive) loads.


B. Numericals based on converters.
Unit III (8+1 Hrs)
INVERTERS DC / AC

A. Half bridge and push pull type inverters : Circuit diagram, operation & waveforms.

Full bridge inverters: Circuit diagram, operation & waveforms for R & RL loads.
Switching techniques for obtaining square, quasi-square o/p waveforms.
Fourier analysis of square and quasi-square voltage waveform & harmonics.
Harmonic reduction techniques. Advantage of sine weighted PWM over single pulse PWM techniques.
Inverter configuration for IM drive

B. Numericals based on Inverter performance.

Unit IV (8+1 Hrs)
SWITCHED & RESONANT DC/ DC CONVERTERS

A. Step Up / Down chopper: Circuit diagram, operation and waveforms for R and L load.
Load voltage calculations.
SMPS : Circuit diagram, operation and waveforms, of Fly back converter and forward converter.
Need for resonant converters, ZVS, ZCS Switches.
B. Comparison of linear, switched and resonant power supplies.

Unit V (6+1 Hrs)
APPLICATIONS OF POWER ELECTRONICS

A. Study of power circuits for Electronic ballast , HF induction heating, RF heating, Welding.
ON-line and OFF line UPS, battery selection and design considerations.
HVDC transmission, twelve pulse converter, and advantages over HVAC transmission.
Stator voltage control for IM motors.
B. Industrial applications of motor drives, Study of Cycloconverter.

Text Books

Reference Books
Course Outcomes:

After completion of this course, student will be able to –

1. Describe the operation, characteristics and applications of power devices like SCR, power diode, power BJT, power MOSFET and IGBT.
2. Analyze AC-DC (Rectifier) and DC-DC (Chopper) circuits in terms of performance parameters.
3. Analyze DC-AC (Inverter) and AC-AC (Controller) circuits in terms of performance parameters.
4. Describe the role of Power Electronics in utility-related applications.
Laboratory Course Syllabus

**EC 30309::POWER ELECTRONICS**

| Credits: 1 | Teaching Scheme: - Practical 2 Hrs/Week |

**List of Practicals**

1. To study Triggering circuits for SCR.
2. To study Driver circuits for IGBT / MOSFET / Commutation circuits for SCR.
3. To study power conversion system with R/L load (AC-DC) (Half controlled)
4. To study power conversion system with R/L/E load (AC-DC) (Fully controlled)
5. To study power conversion system with load (DC-AC).
6. To study power electronic conversion system with load (DC-DC).
7. To study power electronic conversion system with load (DC-DC) (MOSFET or IGBT based step-up converter)
8. To study power electronic conversion system with load (AC-AC)/ Study of UPS/SMPS
9. To simulate power electronic conversion system (AC-DC/ DC-AC), with suitable load.
10. Simulation of power electronic conversion system (DC-DC/AC-AC), with suitable load.

**Text Books**


**Course Outcomes:**

After completion of this course, student will be able to -

1. Apply suitable driver circuits for power devices.
2. Evaluate the performance of converters and correlate the results with theoretical values.
EC30107 :: DIGITAL INTEGRATED CIRCUITS

Credits: 03 Teaching Scheme: - Theory 3 Hrs/Week

Unit I: Introduction to HDL (8 Hrs)
A. Digital Hardware: Standard Chips, PLDs, FPGAs and ASICs. VLSI design flow. Typical CAD system. Role of hardware description languages, motivation.
Basic constructs in VHDL: Design units, Data types, data objects, data operators.
Dataflow modeling: Conditional and selected signal assignment statements. Concurrency in VHDL. Delay models: Inertial Delay, transport delay, Delta delay, waveform and timing.

B. Study of circuit diagram and functionality of simple digital circuits like full adder, multiplexer, ROM, de-multiplexer, decoder, priority encoder, comparator. VLSI CAD tools in industry.

Unit II: Modeling in VHDL (8 Hrs)
A. Structural modeling, component declaration, instantiation, Code for digital circuits like 4 bit adder, 4 bit shift register in structural model.
Behavioral Modeling: Process construct, if, using predefined attributes - event, last_value, wait statement. Test bench for combinational circuits.

B. Study of circuit diagram and functionality of four bit adder, fast adder, shift register, barrel shifter, multiplier. Structural model with Generate statement.

Unit III: Advanced Topics (8 Hrs)
A. Behavioral constructs: case, loop statements, using predefined functions, variable declaration, user defined data type declaration, state machine modeling.
Using predefined packages, configurations and generics. Test bench for sequential circuits.
Sub-programs: Functions, Procedures, overloading.
Synthesis: How to avoid simulation synthesis mismatch, Synthesizable and non-synthesizable statements, Coding for hardware optimization.

B. Study of circuit diagram and functionality of various building blocks of microprocessor like RAM, stack, instruction decoder etc. Simulation - synthesis difference.

Unit IV: Static CMOS (8 Hrs)
A. CMOS inverter: Analysis of VTC, Noise margin, Power and energy consumption, Power delay product.
Combinational logic design: Weak and strong logic output,
Complementary CMOS logic style: Design of PUN and PDN, logic efforts for logic gates, design techniques for large fan in. Ratioed logic style: design of $R_L$, performance with adaptive load. Other logic styles like DCVSL, Pass transistor logic, Transmission gate.

B. Design and analysis of basic logic gates using logic families studied in unit IV.

**Unit V: Dynamic CMOS** (8 Hrs)

A. Dynamic logic: basic principles, Signal integrity issues, cascading. Domino logic: Non inverting property, logic optimization.

Sequential circuit Design: Latches and registers based on Multiplexer, NMOS pass transistor, $C^2$MOS, TSPC styles. issues of clock overlapping, race condition.

Optimization of sequential circuits: Pipelining concept, Latch based pipelining.

B. Design and analysis of basic logic gates using dynamic and domino logic style.

**Text Books**


**Reference Books**


**Course Outcomes:**

The student will be able to-

1. Describe the stepwise VLSI Design Process and basic VHDL construct.
2. Write VHDL code for digital Circuits along with test-bench.
3. Select VHDL statement for coding and synthesis optimization.
4. Analyze combinational and sequential circuit for pipelining.
Laboratory Course Syllabus

EC30310: DIGITAL INTEGRATED CIRCUITS

Credits: 01  
Teaching Scheme: Lab 2 Hrs/Week

List of Practicals
1. To simulate and synthesize 1 bit full adder/decoder
2. To simulate and synthesize ROM / Multiplexer
3. To simulate and synthesize D Flip flop
4. To simulate and synthesize BCD Counter
5. To simulate and synthesize Shift register using structural model
6. To simulate and synthesize a state machine based sequence detector.
7. To simulate and synthesize RAM
8. To analyze the characteristics of CMOS logic gate using simulator tool
9. Miniproject
   (Experiment no 1 to 7 and 9 to be performed using VHDL)

Text Books

Course Outcomes:

The student will be able to-
1. Make use of modern electronic circuit simulation tools.
2. Simulate the VHDL code for combinational and sequential circuits.
3. Synthesize the VHDL code for combinational and sequential circuits.
UNIT 1: Introduction to Energy Sources  (8 HRS)
B). Energy efficiency conversion.

UNIT 2: Solar Energy  (8 HRS)
B). On Grid Solar System

UNIT 3: Solar PV Panel  (8 HRS)
B). Energy storage method.

UNIT 4: Design of Solar Module.  (8 HRS)
A). Output of chosen solar module, Number of Module required, Typical solar home Systems. System wiring, Planning an installation of the system, (System wiring, cable sizing, line losses, Permissible voltage drop in conductor, Calculating voltage drop, Calculating voltage drop in typical systems), Choosing correct cable size, Circuit protection, Sizing main battery fuses, Sub-circuit protection). Planning an installation (Design and installation plan which includes load assessment, system design, Explaining long term maintenance costs, siting the batteries, siting the solar module, siting the controller, locating lights and switches, preparing the wiring diagram, calculating the voltage drop, preparing necessary approvals.). Installation of solar module. (roof/pole), Installation of Batteries, Installation of controller, etc.
B). Self study of typical installation in area.

UNIT 5: Solar Electric Power and Government role  (8 HRS)
A). Details of solar panel, inverter and metering of solar based electricity, Open Access a mode of power supply availability and market challenges, Feasibility of solar system from
solar radiation point of view and other factors, Global opportunity in the field of Solar, Government support/ schemes for motivating the promotion of pollution free green energy.

Misc.

B). Study of Government Promotion Policies at State/National level

Text Books
2. The Solar Entrepreneur’s Hand Book, Geoff Stapleton, Lalith Gunaratne, Peter J M Konings, Bibek Bandyopadhay ,World Institute of Sustainable Energy (WISE)

Course Outcomes:
The student will be able to-
1. Explain Renewable energy sources.
2. Design a solar module based on applications.
3. Identify market challenges and government schemes for Solar power development.
Project Course Syllabus
EC37403: Miniproject

Credits:2  Teaching Scheme: 4Hours / Week

Guidelines:

Mini Project will be based on all subjects of that Semester except GP.

5. It is applicable to Semester I irrespective of module (5 or 6).

6. The Semester Mini Project will be for a group of 3 to 5 students. Head of Department to appoint Mini Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.

7. Group formation, discussion with faculty advisor/guide, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

8. The Assessment Scheme will be:

   (a) **Continuous Assessment 50 marks** *(based on regular interaction, circuit development)*

   (b) **End Semester 50 marks** *(based on implementation, testing, results, poster presentation, and demonstration)*

**Course Outcomes:**
The student will be able to –

1. Planning and implementation of hardware/ software project
2. Prepare the budget for hardware requirement
3. Demonstrate the project.
4. Work as a team member.
Project Course Syllabus

EC37302: Major Project I

Credits:2  
Teaching Scheme: 2 Hours / Week

Guidelines:

8. The project work should be carried out by a group of three to four students.

9. The project topic should be finalized with the consent of Project Guide in stage-I after carrying out literature survey/study in the related area. Its implementation can be carried out in stage II and stage III.

10. Interdisciplinary project topic, if any, can be selected with the consent of the guide and coordinating committees of respective disciplines.

11. For the sponsored project, students should submit the approval by the respective industry.

12. A logbook should be maintained by the group throughout all the three Project stages containing the details of work done, problems faced, solutions evolved etc. and should be duly signed by the Internal and/or External guide on regular intervals.

13. Both the Project progress review reports for this stage should be submitted in the prescribed format only after approval from the guide.

14. Abstract of the project should be submitted in the prescribed format at the time of Stage-1 evaluation.

Course Outcomes:

The student will be able to

5) Identify the area for project work through literature survey.

6) Plan the project activity with the constraints required to implement it.

7) Develop communication and presentation skill.

8) Work as team member for core/multidisciplinary projects.
Seminar Course Syllabus

EC 37301: Technical Seminar

Credits: 2  
Teaching Scheme: - Lab 4 Hrs/Week

Guidelines:

- It is applicable to semester II irrespective of module (5 or 6).
- A seminar based on relevant disciplinary or interdisciplinary topic is to be presented by every candidate during the semester. It consists of Literature Survey, study of system and analysis.
- The selection of the topic should be based on references from magazines, transactions, reference books and other technical literature.
- The approval of the Department Head/Coordinator prior to commencement of work and presentation is essential.(ISO registration form FF105 is to be filled.)
- The seminar progress is reviewed during the semester. In the reviews the applicability and the relevance of the topic etc. is discussed.
- The student is expected to produce a report based on the work carried out. The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.

- **Guidelines for evaluation of seminar:**
  9. Timely submission of abstract – 10%
  10. Literature review – 10%
  11. Regular reporting during semester - 10%
  12. Attendance during seminar presentation – self and peer – 10%
  13. Relevance of seminar topic – 10%
  14. Technical contents – 10%
  15. Presentation – 25%
  16. Questions and answer session – 15%
Course outcomes:

Upon completion of this course students will be able to

5. Identify the area for seminar through literature survey.
6. Enhance presentation skill and technical writing
7. Develop good communication skill.
8. Develop research attributes (essential for major project activity)
Laboratory Course Syllabus

EC33301: OPTIMIZATION TECHNIQUES

| Credits: 01 | Teaching Scheme: - Laboratory 2 Hrs/Week |

Experiment List:

1. To implement algorithm to find the Eigen number and Eigen vector.
2. To implement data fitting algorithm.
3. Implement Polynomial interpolation methods.
4. To implement gradient and conjugate gradient type algorithm.
5. To implement Newton’s Method Type Algorithm.
6. To implement Golden section Rule.
7. To implement the iterative method.
8. To implement Fourier series (Orthogonality).

Course Outcomes:

The student will be able to-

1. Implement searching algorithms.
2. Create optimization problem statement.
**Laboratory Course Syllabus**

<table>
<thead>
<tr>
<th>EC33302: MATLAB SIMULINK AND SIMULATION TOOLS</th>
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<tr>
<td><strong>Credits:</strong> 01</td>
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**List of practicals**

1. Overview of MATLAB, Arrays and matrices, Linear algebra, Polynomials, Interpolation
2. Data analysis and modeling, FFT, Ordinary differential equations, Curve fitting
4. Graphics – II: Graphics handling, 3-D Visualization, GUI development
5. Programming – I: Data types, Data type conversions, Bitwise / Logical / Set / Date – Time operations
6. Programming – II: Function and scripts, Evaluation, Control flow, Error handling, Mex programming, Object oriented programming
7. Simulink – I: Commonly used blocks, Sources, Sinks, Lookup tables, Math operations
8. Simulink – II: Model development, Model verification, Model-wide utilities, Ports and subsystems

**Course Outcomes:**

The student will be able to

1. Write program modules for data analysis, modeling, curve fitting.
2. Create plots, subplots, specialized plots, 3-D plots.
3. Develop Graphical User Interface (GUI) for various applications.
4. Develop models using Simulink to solve engineering problems.
Laboratory Course Syllabus

<table>
<thead>
<tr>
<th>EC33303: CONFIGURABLE AND RECONFIGURABLE COMPUTING</th>
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<tbody>
<tr>
<td>Credits: 01</td>
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<tr>
<td>Teaching Scheme: - Laboratory 2 Hrs/Week</td>
</tr>
</tbody>
</table>

List of Practicals:

1. Introduction to verilog, Introduction to EDA tool
2. Coding for Structural modeling at gate level synthesis and simulation
3. Coding for switch level modeling
4. Coding to exhibit operation of concatenation / logical / relational / equality / shift operator in dataflow model
5. Coding in dataflow model using conditional operator
6. Coding illustrating use of always block, forever loop
7. Coding using case statement
8. Blocking non blocking statements for coding of shift register
9. State diagram based coding
10. Assertion based verification.

Course Outcomes:
The student will be able to-
1. Make use of modern electronic circuit simulation tools.
2. Simulate the Verilog code for combinational and sequential circuits.
EC33304 : LINUX OPERATING SYSTEM

| Credits: 01 | Teaching Scheme: - Laboratory 2 Hrs/Week |

List of Experiments

1. Installation of Linux
2. Consol and Vi Editor
3. File Related commands
4. Miscellaneous commands 1
5. Miscellaneous commands 2
6. Shell script 1
7. Shell script 2
8. C programming 1
9. C programming 2
10. Installation of software on Linux

Text Books
1. Any basic book on Linux or Unix
2. Neil Matthew, Richard Stones, Beginning Linux Programming, Wilye

Course Outcomes:
Student will be able to
1. Explain structure of Linux OS
2. Make use of Linux shell commands
3. Develop C programs on Linux platform
Laboratory Course Syllabus

EC 33306 : PIC MICROCONTROLLER

| Credits: 01 | Teaching Scheme: - Laboratory 2 Hrs/Week |

List of Practicals

2. I/O PORT Programming
3. Delay using Timers
4. LED interfacing
5. LCD interfacing
6. Keyboard Interfacing
7. Serial Communication
8. ADC and PWM Programming.
9. Miniproject

Text Books
7. Ajay V. Deshmukh ‘Microcontrollers’ (TMH)

References
7. Datasheets of PIC MICROCONTROLLER

Course Outcomes:
The student will be able to-

1. Describe PIC Microcontroller Family.
2. Write assembly/Embedded C language code for PIC 16F877A.
3. Interface different peripherals to PIC 16F877A.
4. Analyze different communication protocols.
5. Design an Embedded System based on PIC 16F877A.
Laboratory Course Syllabus

EC 33307 : DIGITAL SIGNAL AND IMAGE PROCESSING USING MATLAB

Credits: 01  Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals

1. Review of MATLAB basics
2. Frequency domain analysis of signals.
3. Fundamental Image processing Techniques: negation, Binarization etc.
4. Histogram stretching and equalization
5. Image segmentation-Object Separation
6. Advanced Image processing Techniques: Smoothening, Sharpening etc.
7. Image Transforms- DCT, Hough Transform, Wavelet transform etc.
8. Introduction to Graphical user Interface(GUI)
9. Mini-project

Text Books


Reference Books

2. “Getting started with MATLAB 7”, Rudra Pratap

Course Outcomes:
The student will be able to-

1. Explain basic signal and Image processing algorithms like preprocessing, enhancement, segmentation.
2. Develop user defined functions and GUI in MATLAB.
3. Develop applications like data compression, Image coding, Biometrics etc.
Laboratory Course Syllabus

EC33308 : LATEX

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practical

1. Introduction to LaTex
2. Mathematics In LaTex
3. Formatting Environment in LaTex
4. Graphics Environment in Latex
5. Assignment (1) Conversion of Given PDF file into LaTex format (General)
6. Assignment (2) Conversion of Given PDF file into LaTex (Springer Verlag) format
7. Assignment (3) Conversion of Given PDF file into LaTex (Elsevier Science) format
8. Assignment (3) Conversion of Given PDF file into LaTex (IEEE) format F

Course Outcomes:

The student will be able to-

1. Install and use the Latex software on computer.
2. Convert the given document in Latex format.
Laboratory Course Syllabus

EC33309: SPEECH PROCESSING

| Credits: 01 | Teaching Scheme: - Laboratory 2 Hrs/Week |

List of Practicals

1. Identification of voiced, unvoiced and silence regions of speech.
2. Estimation of pitch period using autocorrelation
3. Estimation of pitch period using Spectral domain
4. Estimation of pitch period using Cepstral domain
5. Evaluation of formants for the voiced & unvoiced speech segment
7. Calculation of Linear Predictor coefficients
8. Short-time spectral analysis of speech
9. Two Assignments

Reference Books


Course Outcomes:
The student will be able to-
1. Explain speech production model and parameters of speech.
2. Calculate pitch by time domain, frequency domain and cepstral domain method.
4. Calculate linear prediction coefficients.
Laboratory Course Syllabus

EC 33310 : REAL TIME SIGNAL PROCESSING

Credits: 01
Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals

2. Review of MATLAB basics
10. Verification of sampling theorem
11. Design of Filters- Notch, Low pass, High pass
12. Fundamental Image processing Techniques: Histogram, Negation, Binarization
13. Z Transform, pole zero plot, Applications
14. Real time data acquisition in MATLAB
15. Application based Real time signal processing
16. Introduction to TMS320C6713 DSP processor kit
17. Basic signal processing algorithm implementation on TMS320C6713 kit

Mini-project

Text Books

Reference Books
4. “Getting started with MATLAB 7”, Rudra Pratap

Course Outcomes:
The student will be able to
1. Explain basic signal and Image processing algorithms like sampling, preprocessing, enhancement, Transform.
2. Implement basic signal processing algorithms on TMS320C6713 Texas instruments DSP processor.
Laboratory Course Syllabus

EC33312 : SWITCH BASED SIMULATION

| Credits: 01 | Teaching Scheme: - Practical 2 Hrs/Week |

List of Practicals

1. Introduction to IRSIM
2. Simulation of basic logic gates
3. Simulation of logic functions using AOI and OAI form
4. Simulation of combinational circuit like Half adder, Full adder, Multiplexer, De multiplexer etc
5. Simulation of sequential circuit like Latches, Flip flop, Register, Counter etc
6. Design and simulation of a small digital circuit

Course Outcomes:

The student will be able to

1. Demonstrate the simulation steps in IRSIM software.
2. Simulate digital logic gates, combinational and sequential circuits.
3. Analyze digital circuits.
Laboratory Course Syllabus

EC 33313 : WIRELESS NETWORK

Credits: 01
Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals

1. Network Simulator basics
2. Implementation of Simple wireless networks with star topology
3. Implementation of Simple wireless networks with Cluster Tree topology
4. Performance analysis of Randomly deployed Wireless networks
5. Performance analysis of high density Wireless networks
6. Implementation of Wireless network application1
7. Implementation of Wireless network application2
8. Configuration of MAC Layer
9. WiFi interference measurement
10. Mini Project

Text Books


Reference Books


Course Outcomes:

The student will be able to-

1. Analyse the Wireless LAN signal Interference.
2. Develop algorithms to implement heterogeneous networks.
5. Design wireless network for healthcare applications.
Laboratory Course Syllabus

EC33314 : PCB DESIGN

Credits: 01  Teaching Scheme: - Practical 2 Hrs/Week

List of Practicals

1. Introduction of PCB Design
2. Documentation
3. Operation PCB design software
4. Design of single sided board Part 1
5. Design of single sided board Part 2
6. Design of double sided board Part 1
7. Design of double sided board Part 2
8. Checklist for good and quality PCB design
9. PCB Fabrication Part 1
10. PCB Fabrication Part 2
11. Exam conduction
12. Exam conduction

Course Outcomes:
The student will be able to-
1. Operate the PCB design software.
2. Prepare single sided PCB for given circuit diagram.
3. Prepare double sided PCB for given circuit diagram.
Laboratory Course Syllabus

**EC33315 : NETWORKING – INDUSTRIAL AUTOMATION**

<table>
<thead>
<tr>
<th>Credits:</th>
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<tr>
<td>Teaching Scheme:</td>
<td>Practical 2 Hrs/Week</td>
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List of Practicals:

1. LAN Switching- Ethernet LAN Switching Concept
2. IP Routing- IP Addressing & Subnetting
3. Wide-Area Network- WAN Configuration
4. Medium-Sized Network - Implementing VLANs & Trunks, Spanning Trees
5. Routing - Routing Between Vlans, Routing protocols
6. OSPF - Concept & Implementation
7. EIGRP - Concept & Implementation
8. Access Control Lists- Types ACL, WLAN, IPV6, VPN
9. Case Study- Industrial Case Studies

Course Outcomes:
The student will be able to-

1. Apply the knowledge for LAN switching and IP routing
2. Implement WAN and medium sized network
3. Explain Routing protocols.
4. Design a network.
## Laboratory Course Syllabus

**EC33316 : INDUSTRIAL WIRELESS COMMUNICATION**

<table>
<thead>
<tr>
<th>Credits: 01</th>
<th>Teaching Scheme: - Practical 2 Hrs/Week</th>
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List of Practicals:

1. Use of Blue Tooth for long distance of about 1000 meters
2. Use of Blue Tooth for conference call within the premises
3. Design of ZigBee mesh network
4. Data transfer from Bar Code Reader to 4 PCs at the same time by Zig Bee modules.
5. Concept of Zig Bee Co-Ordinator, Rourter, End Device
6. TEXT File transfer from one PC to hand held device using Wi-Fi devices
7. Monitor the productivity of a CNC machine, on a remote desktop
8. Recap
9. Exam conduction

**Course Outcomes:**
The student will be able to-

1. Explain Bluetooth, Zigbee and Wi-Fi technology.
2. Apply the technology on real life.
Laboratory Course Syllabus

**EC33317: INTRODUCTION TO MEDICAL EQUIPMENTS**

| Credits: 01 | Teaching Scheme: - Practical 2 Hrs/Week |

**List of Practicals:**

1. To study different subsystems of Human body
2. To study Generation of Bio-signals and different sensors used to pick up Biosignals.
3. To study different aspects of Hospital management.
4. To study different sections/departments in hospital.
5. To study major equipments used in hospital.
6. To study the process of Installation of equipments in hospital.
7. To study maintenance and servicing of medical instruments/Equipments.
8. To discuss case studies related to latest medical equipments.
9. Visit to hospital.

**Course Outcomes:**
The student will be able to-

1. Explain basics of human physiology and different types of Biosignals.
2. Explain Hospital management functioning.
3. Identify different sections in hospitals with major equipments used in hospital.
Laboratory Course Syllabus

EC 33318 : PLC Programming

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals

1. Basics of Automation; Sensors and Actuators; Automation using conventional electrical components like relays; PLC Evolution ; PLC Advantages and Disadvantages

2. Understanding PLC hardware architecture/System components; Field Devices – Wiring to Field Devices

3. Introduction to PLC Programming Software; Understanding Communications: Study and configure different communication protocols.

4. Data Addressing ; PLC Operation – Scanning process

5. Programming with PLC using relay type of instructions.

6. Programming with timer and counter.

7. Diagnostics and trouble shooting

8. Programming for real time applications and interfacing of sensors and actuators.

9. Mini project

10. Mini Project

Text Books :

5. “Programmable Logic Controller”, Frank Petruzella.

Course Outcomes:

Students will be able to

1. Explain the architecture of PLC.
2. Develop Programs using ladder logic with AB PLC.
3. Interface I/O devices to PLC to implement real time applications.
Laboratory Course Syllabus

<table>
<thead>
<tr>
<th>EC 33319: FPGA Based System Design</th>
<th>Teaching Scheme: - Laboratory 2 Hrs/Week</th>
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<tr>
<td>Credits: 01</td>
<td>Laboratory 2 Hrs/Week</td>
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List of Practical:

1. State Machine Design using FPGA
2. FIR filter implementation
3. Booth multiplier
4. Viterbi decoder
5. SRAM memory controller
6. FPGA design using soft IP
7. Simple project like filter design

Course Outcomes:
The student will be able to-

1. Apply knowledge of digital electronics for designing efficient and optimized digital circuits.
2. Explain reconfigurable logic using FPGA as the basis.
3. Design a system on FPGA, simulate it and implement in hardware.
EC33322: Digital Circuit Design

Credits: 01  
Teaching Scheme: - Laboratory 2 Hrs/Week

List of Practicals

1. MOS transistor theory and logic gates revision, Construction of logic gate schematics and netlisting concept
2. Introduction to spice models and simulation
3. Simulation of basic gates constructed in Lab 1
4. Construction and simulation of simple logic paths
5. Introduction to Flops
6. Flop schematic construction
7. Setup and Hold characterization criteria
8. Setup and Hold characterization simulation
9. Maxtime path equation and schematic construction
10. Maxtime Critical Path simulation – timing slack and violation
11. Mintime path equation and schematic construction
12. Mintime Critical Path simulation – timing slack and violation

Text Books  
1. CMOS VLSI Design - Neil Weste, David Harris

Course Outcomes:
The student will be able to-
1. Elucidate concepts of transistor modeling, netlisting and simulation of circuits using Cppsim and ngspice or similar tools.
2. Analyze timing of critical and mintime paths from simulation waveforms and measurement data using Cppsim and ngspice or similar tools.
3. Apply knowledge of setup, hold and timing for designing circuits in the field of SRAM, Register files, Data paths using Cppsim and ngspice or similar tools.