Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE
of Science, Humanities and Commerce, Sainikpuri
Autonomous College | Affiliated to Osmania University
Reaccredited with 'A' Grade by NAAC

Syllabus - B Sc II Year Electronics
(w.e.f academic year: 2024 – 25)

Semester III

Course Name: Analog Circuits **Course Code: EL324** (60 Hours)

HPW: 4 **Credits: 4**

Course Objectives: This course aims to -
COB1: *learn the working principle of DC power supply*
COB2: *design and analyze the regulated DC power supplies*
COB3: *understand the methods of biasing transistors to design and analyze single stage transistor amplifier circuits*
COB4: *apply positive feedback in amplifiers for the design of oscillators and multivibrators*

Unit - I **(15Hrs)**

Rectifiers: Rectifier– half wave, full wave and bridge rectifiers, Ripple factor, Efficiency, regulation, harmonic components in rectified output.

Filters: choke input (inductor) filter, Shunt capacitor filter, L section and π section filters.

Unit - II **(15Hrs)**

Regulated Power Supplies: Zener regulation, Block diagram of regulated power supply, Series and shunt regulated power supplies.

IC regulators - three terminal regulators (78XX and 79XX), variable voltage regulators. Principle and working of switch mode power supply (SMPS). UPS –Principle and working.

Unit– III **(15Hrs)**

Transistor amplifier: Classification of amplifiers, Hybrid π model of a transistor, RC coupled CE amplifier – frequency response – analysis.

Feedback in amplifiers: Positive and negative feedback- Effect of negative feedback on gain, bandwidth, noise, input and output impedances. Emitter follower and Darlington pair.

Unit – IV **(15Hrs)**

Oscillators: Barkhausen criterion for sustained oscillations, RC oscillators - RC phase shift and Wein's bridge oscillators, LC oscillators - Hartley and Colpitts, crystal oscillator.

Multivibrators: Astable, Monostable and Bistable multivibrators.

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Course Outcomes: *At the end of this course, students will be able to-*

CO1*: Design and construct a dc regulated power supply*
CO2*: Design amplifiers using BJT and study frequency responses*
CO3*: Understand the effect of positive feedback and construct different oscillators*
CO4*: Develop the skill to build and troubleshoot analog circuits*

Reference Books:

1. Electronic Devices and Circuits by Millman and Halkias - TMH
2. Basic Electronics and linear circuits by Bhargava, Kulshreshta & Gupta - TMH
3. A first course in Electronics by AA Khan and KK Dey-PHI
4. Electronic Devices and Circuit Theory by Robert L Boylestad & Louis Nashelsky

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Semester III

Course Name: Analog Circuits Lab **Course Code: EL324P**

HPW: 2 **Credits: 1**

Course Objectives: This course aims to –

COB1*: Understand and design the analog circuits*

COB2: *Learn circuit simulation for the analysis of electronic circuits.*

List of experiments:

1. Study of HWR, FWR and bridge rectifier, determination of ripple factor.
2. Series inductor, shunt capacitor, L-section and π-section filters; determination of ripple factor.
3. Study of voltage regulation using IC 7805 & 7905.
4. RC coupled amplifier
5. Emitter follower.
6. RC Phase shift oscillator.
7. Astable multivibrator.
8. Simulation experiments
   a) Rectifiers
   b) RC coupled amplifier
   c) Wein's bridge oscillator
   d) Colpitts oscillator
   e) RC phase shift oscillator
   f) Astable multivibrator

Note: Students must perform a minimum of SIX experiments. Experiment no. 8 is compulsory.

Course Outcomes:

Upon successful completion of this course student will be able to -

CO1: Design analog circuits and evaluate their performance characteristics.

CO2: Simulate and analyze analog circuits for different electronic applications.

Reference Books:

1. Basic Electronics – A Text Lab Manual by Zbar, Malvino, Miller.

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Syllabus - B Sc II Year Electronics
(w.e.f academic year 2024-25)

Semester III

Course Name: PC Hardware and Networking **Course Code: SE324A**(30 Hours)
HPW: 2 **Credits: 2**

Course Objectives: The course aims to -
COB1: Familiarize with the type of devices/components that may be mounted on Motherboard
COB2: know network architecture and various protocols

Unit – I **(15Hrs)**

Hardware Identification: Chipsets - North bridge, south bridge,
Motherboard-components, form factors (AT, ATX, BTX),
CPU (Intel Processors specifications: Pentium-IV, i3, i5, i7),
I/O cards – PCI, PCIe, VGA, Ethernet Card and Sound Card, Memory –RAM and ROM,
Disk drives– CD, DVD, HD, USB flash drives.

Unit– II **(15Hrs)**

Network: Introduction to network, Cables and Connectors, topologies and transmission media. Introduction to LAN, MAN, WAN.
Protocol: Need for protocol architecture, Introduction to OSI reference model, TCP/IP model.
Internet protocol: IP addresses, classification, differences between IPV4 and IPV6.Network Devices: Switches, Bridges, Hubs, Routers,
Introduction to Bluetooth and WiFi.

Course Outcomes: At the end of this course, students will be able to -
CO1: apply the knowledge of computer assembling and trouble shooting
CO2: troubleshoot network issues.

Suggested Books:

1. Upgrading and Repairing PCs by Scott Mueller.
2. PC Hardware: A Beginner's Guide by Ron Gilster – McGraw Hill Education
3. Peter Norton's Introduction to computers - Tata McGraw Hill, 5th Edition.
4. Data and computer communication by William Stallings - PH Publications 7th Edition

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Semester III

Course Name: Instrumentation Skills **Course Code: SE324B** (30 Hours)
HPW: 2 **Credits: 2**

Course Objectives: This course aims to -
COB1: get exposure with various aspects of instruments and their usage
COB2: learn basic concepts of the bridge configurations and their applications.

Unit-I **(15Hrs)**

Basics of Measurement: Instruments - accuracy, precision, sensitivity, resolution, range, etc. Errors in measurements and loading effects. Multimeter - Principles of measurement of de voltage and de current, ac voltage, ac current and resistance.

Digital Instruments: Principle and working of digital meters. Comparison of analog & digital instruments. Characteristics of a digital meter. Working principles of digital voltmeter. Frequency meter (block diagram only) - timer/counter, phase.

Unit -II **(15Hrs)**

Sensor Technologies: AC Bridge Theory-Circuit and balance equations, bridges for measurement of R, C, L and frequency, Wien's Bridge, De Sauty's, Scherring Bridge, Maxwell Bridge; Q-meter, power and energy measurement - Wattmeter.
Sensors: Resistive, capacitive, inductive, piezoelectric, photo electric and ultrasound sensors; Transducers for instrumentation: displacement, force, vibration, pressure, flow, temperature, liquid level and pH measurement.

Course Outcomes: After completion of this course, students will be able to-
CO1: Employ appropriate instruments to measure given sets of parameters.
CO2: Construct and test measuring setups for electronic systems.

Suggested Books:

1. Electronic Instrumentation and Measurements by David A. Bell; Oxford University Press
2. Instrumentation Devices and Systems by C S Rangan, G R Sarma, V.S. Mani; McGraw Hill.
3. Electronic Instrumentation and Measurement Techniques by W. D. Cooper
4. Measurement and Instrumentation Theory and Application by Allen S Morris, Reza Langari; Academic Press

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Semester IV

Course Name: Operational Amplifiers and Communications **Course Code: EL424**(60 Hours)
HPW: 4 **Credits: 4**

Learning Objectives: The course aims to -
COB1: Provide the basic education in the working of linear integrated circuits
COB2: Understand the Op Amp ICs - construction, characteristics, parameter limitations and its applications
COB3: Give basic knowledge of analog communication.
COB4: Become proficient with computer simulation skills for the analysis and design of circuits.

Unit - I **(15Hrs)**

Operational Amplifiers: Differential amplifier, Block diagram of Op Amp. Ideal characteristics of Op Amp.; Op Amp. parameters – Input resistance, Output resistance, Common mode rejection ratio (CMMR), Slew rate, Offset voltages, Input bias current, Frequency response of Op Amp.
Basic Op Amp circuits– Inverting Op Amp, Virtual ground, Non-inverting Op Amp, Applications of Op Amp: Summing amplifier, subtractor, Comparator, Voltage follower, Integrator, Differentiator.

Unit- II **(15Hrs)**

Applications of Op Amp: Logarithmic amplifier, Sine wave [Wien Bridge] and square wave [Astable] generators, Triangular wave generator, Monostable multivibrator, Solving simple second order differential equation. Basic Op Amp series regulator and shunt regulator,
IC 555 Timer [Block diagram and its working], IC 555 as Astable and monostable multivibrators.

Unit - III **(15Hrs)**

Modulation Insights from Indian Heritage: Ancient Indian insights, such as Ākāśa as a transmission medium, Pingala's binary number system, and Sāṁkhya philosophy, reveal fascinating links to modern wireless communication, the electromagnetic spectrum, and digital modulation techniques. Need for modulation-Types of modulation- Amplitude, Frequency and Phase modulation.
Amplitude modulation: Analysis of Amplitude modulation, side bands, modulation index, AM modulator, Demodulation – diode detector.

Unit - IV **(15Hrs)**

Frequency modulation: Analysis of FM. Working of simple frequency modulator - varactor diode and reactance modulator; detection of FM waves–balanced slope, ratio detector. Advantages of frequency modulation.
Block Diagram of AM and FM Radio Transmitters and Receivers.

Pulse modulation: PAM, PWM, PPM; PCM and Delta modulations.

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Course Outcomes: *At the end of this course, students will be able to-*

CO1: *Understand basic differential amplifier and applications in linear Integrated circuits*
CO2*: Construct various circuits using Op Amp and IC 555.*
CO3: *Understand the concepts of modulation, detection and transmission, reception.*
CO4: *Analyze modulator and detector circuits.*

Reference Books:

1. Op amps and linear Integrated Circuits by Ramakant Gayakwad - PHI
2. Linear Integrated Circuits by D Roy Choudhury & Shail B Jain
3. Electronic Communication Systems by George Kennedy & Bernard Davis - PHI
4. Principles of Electronic Communication Systems by Louis E Freznel - TMH
5. Introduction to Indian KnowIedge system: Concepts and Applications, by Nagendra Pavana, Vinayak Rajat Bhat. PHI Learning, ISBN-13 : 978-9391818203
6. Science and Technology in Ancient Indian Texts by Bal Ram Singh, Nath Girish and Umesh Kumar Singh. D.K. Print World Ltd; 1st edition (30 January 2012); D.K. Print world Pvt. Ltd., Vedasri F-395, Sudarshan Park, New Delhi - 110015, ISBN-10 : 9788124606322

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Course Name: Operational Amplifiers and Communications Lab **Course Code: EL424P**

HPW: 2 **Credits: 1**

Course Objectives: This course aims to –

COB1: Design and testing of analog circuits using Op Amps

COB2: Use of circuit simulation for the analysis of electronic circuits

List of experiments:

Using Op Amp

1. Inverting and non-inverting amplifiers
2. Comparator (Zero crossing detector)
3. Wien's bridge oscillator
4. Astable multivibrator
5. Astable multivibrator using IC 555
6. Monostable multivibrator using IC 555.
7. AM modulator and detector
8. **Simulation of all the above experiments using Op Amp:**
   a) Inverting and non-inverting amplifiers
   b) Summing amplifier and comparator
   c) Integrator/ Differentiator
   d) Wein's bridge oscillator
   e) Astable multivibrator
   f) Astable multivibrator using IC 555

Note: Student must perform minimum of SIX experiments. Experiment no. 8 is compulsory.

Course Outcomes: *Upon successful completion of this course student will be able to -*

CO1: Design analog circuits using Op Amps for different applications

CO2: Simulate and analyze analog circuits using ICs for different electronic applications.

Reference Books:

1. Basic Electronics – A Text Lab Manual by Zbar, Malvino, Miller – McGraw Hill

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Syllabus - B Sc II Year Electronics
(wef academic year: 2024 – 25)
Semester IV

Course Name: Internet of Things (IoT) **Course Code: SE424A** (30 Hours)
HPW: 2 **Credits: 2**

Course Objectives: This course aims to -
COB1: Familiarize with the operating principles of IoT.
COB2: Program IoT devices and use IoT protocols for communication.

Unit-I **(15Hrs)**

Introduction to IoT: Sensing, Actuation, Introduction to Arduino Programming: Integration of Sensors and Actuators. Temperature, soil moisture, ultrasonic and proximity sensors, actuation of DC motors.

Unit-II **(15Hrs)**

Basics of Networking: Communication Protocols, Sensor Networks, Machine-to-Machine Communications, Interoperability in IoT.
Sensor-Cloud, Fog Computing, Smart Cites and Smart Homes, Connected Vehicles, Smart Grid, Industrial IoT.

Case Study: Agriculture/Healthcare/Industrial IoT activity Monitoring.

Course Outcomes: After completion of this course, students will be able to -
CO1: Realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
CO2: Design an Application of IoT in daily life.

Suggested Books:

1. NPTEL, Introduction to IoT https://nptel.ac.in/courses/106105166/
2. Internet of Things- A Hands on Approach by Arshdeep Bahga, Vijay Madisetti, University Press India Pvt. Ltd.
3. The Internet of Things: Enabling Technologies, Platforms and Use Cases by LOCF – Electronic Science 126 Pethuru Raj and Anupama C. Raman (CRC Press)
4. Designing the Internet of Things by Adrian McEwen, Wiley Publishers, 2013, ISBN: 978-1-118-43062-0 2.
5. The Silent Intelligence: The Internet of Things by Daniel Kellmereit 2013, ISBN 0989973700

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Semester IV

Course Name: Design and Fabrication of Printed Circuit Boards
Course Code: SE424B (30 Hours)
HPW: 2 **Credits: 2**

Course Objectives: This course aims to -
COB1: Familiarize with various Electronic Components, Symbols, Footprints, PCB layout technologies.
COB2: Learn Component placement & routing techniques for various technologies

Unit-I **(15Hrs)**

PCB Fundamentals: PCB Advantages, components of PCB, Electronic components, ICs, Surface Mount Devices (SMD). Classification of PCB - single, double, multilayer and flexible boards, Manufacturing of PCB, PCB standards. PCB design considerations/design rules for analog, digital and power applications.

Unit-II **(15Hrs)**

Schematic & Layout Design: Schematic diagram, General, Mechanical and Electrical design considerations, Placing and Mounting of components, Conductor spacing, routing guidelines, heat sinks and package density, Net list, creating components for library, Tracks, Pads, Vias, power plane, grounding.

Technology of PCB: Design automation, Design Rule Checking; Exporting Drill and Gerber Files; Drills; Footprints and Libraries Adding and Editing Pins, copper clad laminates materials of copper clad laminates, soldering techniques. Testing and quality controls.

Course Outcomes: After completion of this course, Students will be able to -
CO1: Understand the PCB layout techniques for optimized component density and power saving.
CO2: Design and print PCB with the help of various image transfer and soldering techniques.

Suggested Books:

1. Printed circuit Board - Design & Technology by Walter C. Bosshart, Tata McGraw Hill.
2. Printed Circuit Board -Design, Fabrication, Assembly & Testing by R.S. Khandpur, TMH.

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