JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ELECTRONICS

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programme

Physics, Mathematics, Electronics

2017-18

PROGRAMME CODE: BSc-04 (2017-18)

Semester	Course Code	Course Title	Course type	No. of credits			
				L	T	P	Total
I	CMA26004	Network Analysis And Analog Electronics	**Core**	04	-	02	06
II	CMB26004	Linear And Digital Integrated Circuits	**Core**	04	-	02	06
III	CMC26004	Communication Electronics	**Core**	04	-	02	06
IV	CMD26004	Microprocessor And Microcontroller	**Core**	04	-	02	06
Discipline Specific Elective papers (DSE 1): **Choose any 1**							
V	CME26004	Digital Signal Processing	DSE-1A	04	-	01	05
	CME26404	Electronic Instrumentation	DSE-1B	04	-	01	05
Discipline Specific Elective papers (DSE 2): **Choose any 1**							
VI	CMF26004	VERILOG & VHDL	DSE-1A	04	-	01	05
	CMF26204	Photonic Devices and Power Electronics	DSE-1B	04	-	01	05
Skill Enhancement Course (SEC) Choose any 1							
V	CME26204	Electrical Circuits And Network Skills	SEC-1A	2	-	-	2
	CME26604	Computer Networks	SEC-1B	2	-	-	2

Assessment Maximum marks – 100

Course type	C1		C2		C3 Exam Marks		Assigned Marks (Percentage)			Total
	Theory	Lab	Theory	Lab	Theory	Lab	Theory	Lab	IA	
DSC	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
DSE	**10**	**05**	**10**	**05**	**70**	**70**	**50**	**20**	**30**	**100**
SEC	**15**	**-**	**15**	**-**	**50**	**-**	**70**	**--**	**30**	**100**

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record
- Each candidate has to perform one experiment in the specified duration of three hours for ***FIFTY marks***
- Practical record has to be valued for ***TEN m*arks** by examiners at the time of examination
- IA for ***TEN marks*** in practical is awarded by continuous assessment in the lab

I. ANALOG & DIGITAL EXPERIMENTS:

Sl no	Component	Marks
1	Write up of the experiment	15
2	Conducting experiment	30
3	Result	05
4	Viva-voce	10
5	Practical record	10
TOTAL		**70**

II. FOR PROGRAMMING EXPERIMENTS:

Sl no	Component	Marks
1	Program Writing	15
2	Entering /Coding	20
3	Execution	10
4	Result / Verification	05
5	Practical record	10
6	Viva	10
TOTAL		**70**

Programme Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PO1: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2: Demonstrate the ability to justify and explain their thinking and/or approach.

PO3: Develop state-of-the-art laboratory and professional communication skills.

PO4: Apply the scientific method to design, execute, and analyze an experiment.

PO5: Explain scientific procedures and their experimental observations.

PO6. Understand the value of Mathematical proof.

PO7: Demonstrate proficiency in writing and understanding proofs.

PO8: Apply mathematical problems and solutions in aspects of science and technology.

PO9: Gain experience to investigate the real world problems.

PO10: Apply mathematical ideas and models to problems.

PO11: Apply appropriate troubleshooting techniques to electronic circuits / systems and perform test procedures.

PO12: Assist, Assemble, modify and test electronic circuits in accordance with job requirements.

PO13: Communicate effectively in technical and non-technical environments.

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1: Find career opportunities.

PSO2: Develop competence to write competitive examinations.

PSO3: Develop proficiency in the analysis of complex physical problems.

PSO4: Use mathematical or other appropriate techniques to solve complex physical problems.

PSO5: Create a hypothesis and appreciate how it relates to broader theories.

PSO6: Demonstrate skills in the use of Computers for control, data acquisition, and data analysis in experimental investigations.

PSO7: Apply knowledge of Physics, Mathematics and Electronics fundamentals to the solve problems in Electronic circuits & communication systems.

PSO8: Apply appropriate troubleshooting techniques to Electronic circuits / systems and perform test procedures.

CMA26004

SEMESTER I

DSC1: NETWORK ANALYSIS AND ANALOG ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate Network theorems with examples

CO2: Specify the classification and characteristics of semiconductor diodes and transistors

CO3: Deliberate in detail the application of semiconductor diodes and transistors

CO4: Understand the characteristics of FET & UJT.

Unit-1

Circuit Analysis:

Concept of Voltage and Current Sources. Kirchhoff's Current Law, Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star and Delta networks - Star-Delta and Delta – Star Conversions. Principal of Duality.

Network Theorems - Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem (Statement and explanation only).

Two Port Networks: h, y and z parameters and their conversion. (15 Lectures)

Unit-2

Junction Diode and its applications:

PN junction diode (Ideal and practical) construction of diode, formation of depletion layer in diode, V-I characteristics. Static and dynamic resistance, dc load line analysis,Quiescent (Q) point.

Zener diode, Reverse saturation current, Zener and avalanche breakdown. Qualitative idea of Schottky diode.

Rectifiers- Half wave rectifier, Full wave rectifiers (center tapped and bridge) - circuit diagrams, working and waveforms, Expressions for ripple factor and efficiency.

Filter- Shunt capacitor filter, working.

Regulation- Line and load regulation, Zener diode as voltage regulator and explanation for load and line regulation. (15 Lectures)

Unit-3

Bipolar Junction Transistor:

Introduction to transistors- construction, types and operation of transistors, Characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. DC load line and Q point.

Transistor biasing:

Need for biasing, DC load line and Q point, Thermal runaway,

Stabilization - stability and stability factor, Expression for stability factor S. (only S_{Ico} derivation), Fixed Bias and Voltage Divider Bias.

Amplifiers:

Definition and classification of amplifiers, single stage CE amplifier- construction, working and frequency response

Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains.

Power amplifiers -Class A (Qualitative analysis), Class B (derivation for expression for efficiency) and class C Amplifiers (Qualitative analysis)

(15 Lectures)

Unit-4

Application of transistors:

Cascaded Amplifiers:

Two stage RC Coupled Amplifier and its Frequency Response.

Feedback in Amplifiers:

Concept of feedback, negative and positive feedback (expression for gain), advantages of negative feedback.

Sinusoidal Oscillators:

Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator - derivation of expression for Frequency and Condition of oscillation.

Unipolar Devices:

JFET -Construction, working and I-V characteristics (output and transfer),expression for Pinch off voltage (no derivation).

UJT - Construction, working, equivalent circuit and I-V characteristics – UJT relaxation oscillator

(15 Lectures)

Reference Books:

• Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).

• Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).

• Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.

• Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

• Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.

• Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill.
• Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.
• Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.
• J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).
• J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991).

NETWORK ANALYSIS AND ANALOG ELECTRONICS LAB

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), digital Multimeter, Function Generator and Oscilloscope.
2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.
3. Verification of Thevenin's theorem and (b) Norton's theorem.
4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem
5. Verification of the Maximum Power Transfer Theorem.
6. Study of the I-V Characteristics of (a) p-n junction Diode and (b) Zener diode.
7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR) with C filter and without filter
8. Zener diode as voltage regulator (at the output of Full Wave Rectifier)
9. Study of the I-V Characteristics of UJT
10. UJT relaxation oscillator.
11. Study of the output and transfer I-V characteristics of common source JFET.
12. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
13. Study of Single Stage CE amplifier.
14. Study of the RC Phase Shift Oscillator.
15. Study the Colpitt`s oscillator.

(Note: Minimum of Eight experiments to be conducted)

CMB26004

SEMESTER II

DSC 2A: LINEAR AND DIGITAL INTEGRATED CIRCUITS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the characteristics and applications of operational amplifiers

CO2: Design different signal conditioning circuits like filters, A/D and D/A converters

CO3: Understand the fundamentals of converting from one number system to another

CO4: Interpret logic functions, combinational and sequential digital circuits

Unit-1

Operational Amplifiers (Black box approach):
Differential amplifier, Block diagram of Op-amp, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configurations, Frequency Response. CMRR. Slew Rate.

Applications of Op-Amps:
Inverting and non-inverting amplifiers and concept of Virtual Ground, (1) Summing, averaging and Scaling amplifiers (2) Difference Amplifier (3) Differentiator (4) Integrator (5) Active low pass and high pass Butterworth filter (1st order only).

(15 Lectures)

Unit-2

Applications of Op-amp contd. &Timer (IC 555):
Wein bridge oscillator, Comparator and Zero-crossing detector
Introduction, 555 Timer - block diagram, 555 as a monostable multivibrator. 555 as an astable multivibrator

D-A and A-D Conversion:
D – A conversion- 4 bit binary weighted and R-2R D-A converters, circuit and working. Accuracy and Resolution.
A-D conversion -characteristics, successive approximation ADC. (Mention of relevant ICs for all). (15 Lectures)

Unit-3

Number System and Codes:

Decimal, Binary, Octal and Hexadecimal number systems –conversion from one system to another. Representation of signed and unsigned binary numbers, Binary arithmetic- addition, Subtraction by 1's and 2's complement method, multiplication& division. Hexadecimal arithmetic – addition and subtraction. BCD code.

Logic Gates and Boolean algebra:

Discussion and Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR Gates. NAND & NOR as universal gates. Basic postulates of Boolean algebra. Principle of duality. De Morgan's theorems. Simplification of Boolean expressions. Boolean expression for logic circuits and vice versa.

Combinational Logic Analysis and Design:

Standard representation of logic functions (SOP and POS), Minimization Techniques - (Karnaugh map minimization up to 4 variables for SOP).

(15 Lectures)

Unit-4

Combinational and sequential circuits:

Arithmetic Circuits:

Binary Addition and subtraction - Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Data processing circuits:

Multiplexers(4 X 1) , De-multiplexers (1 X 4) ,
Decoders- 2 to 4 lines, 3 to 8 lines, BCD to decimal
Encoders - 8 to 3 line, Decimal to BCD encoders

Sequential Circuits:

RS flip flop; clocked RS and D flip flops. JK flip flop. (Level and edge triggered)Race around condition. Preset and Clear operations. Master-slave JK Flip-Flop.

Shift registers:

Study of Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits).

Counters (4 bits):

Asynchronous counters- Ripple counter, Decade Counter, Ring Counter. Synchronous Counter.

(15Lectures)

Reference Books:

- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
- Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford.
- University Press.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).

LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

Section – A: Op-Amp. Circuits (Hardware)

1. To design an inverting amplifier using Op-amp (741)& to study its frequency response
2. To design non-inverting amplifier using Op-amp (741) & to study frequency response.
3. To add two dc voltages using Op-amp in inverting mode.
4. To study the zero-crossing detector and comparator.
5. To investigate the use of an op-amp as an Integrator.
6. To investigate the use of an op-amp as a Differentiator.
7. To study a Wien bridge oscillator using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and 1^{st} / 2^{nd} order differential equation.
9. Design a Butterworth Low Pass active Filter (1st order) & to study Frequency Response.
10. Design a Butterworth High Pass active Filter (1st order) & to study Frequency Response.
11. R – 2R digital to analog converter (DAC).

Section-B: Digital circuits (Hardware)

1. To design a combinational logic system for a specified Truth Table.
2. To convert Boolean expression into logic circuit & design it using logic gate ICs.
3. To minimize a given logic circuit.
4. Half Adder and Full Adder.
5. Half Subtractor and Full Subtractor.

6. 4 bit binary adder and adder-subtractor using Full adder IC.
7. Seven segment decoder.
8. To design an AstableMultivibrator of given specification using IC 555 Timer.
9. To design a MonostableMultivibrator of given specification using IC 555 Timer.
10. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
11. To build JK Master-slave flip-flop using Flip-Flop ICs.
12. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
13. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. To verify the Thevenin's and Norton Theorems.
2. Design and analyze the series and parallel LCR circuits
3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain
4. Design and Verification of op-amp as integrator and differentiator
5. Design the 1st order active low pass and high pass filters of given cut-off frequency
6. Design a Wein Bridge oscillator of given frequency.
7. Design clocked SR and JK Flip-Flop`s using NAND Gates
8. Design 4-bit asynchronous counter using Flip-Flop ICs
9. Design the CE amplifier of a given gain and its frequency response.

(At least 04 experiments each from section A, B and C to be done)

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SEMESTER III

DSC 3: COMMUNICATION ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the classification and characteristics of analog communication systems

CO2: Identify the classification and characteristics of pulse modulation systems

CO3: Specify the classification and characteristics of digital communication systems

CO4: Specify the classification and characteristics of satellite communication systems

CO5: Identify the classification and characteristics of mobile communication systems

Unit-1

Electronic communication:

Introduction to communication – means and modes. Need for modulation. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise, signal-to-noise (S/N) ratio.

Analog Modulation – Amplitude modulation:

Amplitude Modulation, modulation index – expression for modulation index, Analysis of AM wave, Power Relation, Current Calculation, Modulation by several sine waves.Frequency spectrum of AM wave, Generation of AM (Emitter Modulation),

Single side band generation- Balanced modulator and suppression of sidebands using filter method.

Amplitude Demodulation (diode detector), (15 Lectures)

Unit-2

Analog Modulation contd:

Frequency Modulation (FM) and Phase Modulation (PM), modulation index and frequency spectrum, equivalence between FM and PM, Generation of FM using VCO, FM detector (slope detector),

Block diagram of AM & FM super heterodyne receiver

Analog Pulse Modulation:

Channel capacity, sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing. (15 Lectures)

Unit-3

Digital Pulse Modulation:

Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

Introduction to Communication systems: Satellite Communication–

Introduction, need, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Satellite visibility, transponders (C - Band), path loss, ground station, simplified block diagram of earth station (15 Lectures)

Unit-4

Communication systems: Mobile Telephony system –

Mobile Telephony System – Basic concept of mobile communication, frequency bands used in mobile communication, Frequency reuse, Interference, Cell splitting, Sectoring, Segmentation and Dualization, Cellular Telephone Topology, Roaming and Handoffs, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies

GPS navigation system (qualitative idea only) (15 Lectures)

Reference Books:

• Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
• Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.
• Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.
• Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.
• Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill.
• Communication Systems, S. Haykin, 2006, Wiley India.
• Electronic Communication system, Blake, Cengage, 5th edition.
• Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press.

COMMUNICATION ELECTRONICS LAB

1. To study an Amplitude Modulator using Transistor.
2. To study envelope detector for demodulation of AM signal.
3. To study FM – Generator.
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM).
8. To study Pulse Width Modulation (PWM).
9. To study Pulse Position Modulation (PPM).
10. To study ASK, PSK and FSK modulators.
11. IF amplifier.
12. RF amplifier.

(Minimum of eight is to be conducted)

CMD26004

SEMESTER IV

DSC 4: MICROPROCESSOR AND MICROCONTROLLER LAB

Credits: Theory – 04, Practical – 02 **Theory: 60 Lectures**

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the architecture of 8085 microprocessors

CO2: Write down the instruction set and simple programs of 8085 microprocessors.

CO3: Understand the architecture and instruction set of 8051microcontrollers

CO4: Specify the characteristics of embedded system

.**Unit-1**

Microcomputer Organization:

Input/output Devices. Data storage (idea of RAM and ROM). Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.

8085 Microprocessor Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Data and address buses. Registers. ALU. Stack memory. Program counter.

8085 Programming:

Instruction classification, Instructions set - Data transfer, Arithmetic, logical and branch instructions (15 Lectures)

Unit-2

8051 microcontroller:

Introduction and block diagram of 8051 microcontroller, overview of 8051 family, architecture of 8051,

8051 assembly language programming - Inside the 8051, structure of assembly language, Program counter and ROM memory map, data types and directives, 8051 flag bits and the PSW register

8051 I/O port

Introduction of I/O port programming, pin out diagram of8051 microcontroller, I/O port pins description & their functions, (15 Lectures)

Unit-3

8051 Programming:

8051 addressing modes - Immediate and register addressing modes and accessing memory locations using various addressing modes, Bit addresses for I/O and RAM, assembly language instructions using each addressing mode

Arithmetic and logic instructions -Arithmetic instructions, logic and compare instructions, rotate instruction and serializing data, swap instructions

JUMP, LOOP & CALL instructions - Loop and jump instructions, call instructions

(15 Lectures)

Unit-4

8051 programming in C: Data types and time delay in 8051 C, I/O programming in 8051 C, logic operations and manipulation in 8051 C, data conversion programs in 8051 C - for ASCII and BCD conversions.

Introduction to embedded system:

Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications and purpose of embedded systems.

(15 Lectures)

Reference Books:

- Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill.
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A.Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press.
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill.
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011,Cengage Learning

MICROPROCESSOR AND MICROCONTROLLER LAB

Section-A: Programs using 8085 Microprocessor

1. Addition and subtraction of numbers using direct addressing mode.
2. Addition and subtraction of numbers using indirect addressing mode.
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Handling of 16-bit Numbers.
6. Block data handling.
7. Other programs (e.g. Parity Check, etc.).

Section-B: Experiments using 8051 microcontroller:

1. Binary addition , subtraction , multiplication and division
2. 8 bits multiplication and division.
3. Fibonacci series.
4. Average of a number.
5. Square and Square root of a number.
6. Palindrome.
7. BCD to Binary conversion.
8. Finding the smallest and largest numbers from the given N binary numbers.
9. To find that the given numbers is prime or not.
10. To find the factorial of a number.
11. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
12. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's. 5. Program to glow the first four LEDs then next four using TIMER application.
13. Program to rotate the contents of the accumulator first right and then left.
14. Program to run a countdown from 9-0 in the seven segment LED display.
15. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
16. To toggle '1234' as '1324' in the seven segment LED display.
17. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
18. Application of embedded systems: Temperature measurement & display on LCD

Note: At least 04 experiments each from section A and B to be done.

CME26004

SEMESTER V

DSE1A: DIGITAL SIGNAL PROCESSING

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of discrete/digital signals and systems

CO2: Understand the classification and characteristics of frequency domain analysis of discrete time signals.

CO3: Specify with examples DSP filters

Unit-1

Discrete-Time Signals and Systems:
Classification of Signals, Transformations of the Independent Variable, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals, Discrete-Time Systems, System Properties. Impulse Response, Convolution Sum; Graphical Method; Analytical Method, Properties of Convolution; Commutative; Associative; Distributive; Shift; Sum Property System Response to Periodic Inputs, Relationship Between LTI System Properties and the Impulse Response; Causality; Stability; Invertibility, Unit Step Response.

(15 Lectures)

Unit-2

Discrete-Time Fourier Transform:
Fourier Transform Representation of Aperiodic Discrete-Time Signals, Periodicity of DTFT, Properties; Linearity; Time Shifting;Frequency Shifting; Convolution Property.
The *z*-Transform: Bilateral (Two-Sided) *z*-Transform,Inversez-Transform, Relationship Between *z*-Transform and Discrete-Time FourierTransform, *z*-plane, Region-of-Convergence; Properties of ROC, Properties.
Filter Concepts: Phase Delay and Group delay, Zero-Phase Filter, Linear-Phase Filter,Simple FIR Digital Filters, Simple IIR Digital Filters, All pass Filters, Averaging Filters, Notch Filters

(15 Lectures)

Unit-3

Discrete Fourier Transform: Frequency Domain Sampling (Sampling of DTFT), The Discrete Fourier Transform (DFT) and its Inverse, DFT as a Linear transformation, Properties; Periodicity; Linearity; Circular Time Shifting; Circular Frequency Shifting; Circular Time

Reversal; Linear Convolution Using the DFT (Linear Convolution Using Circular Convolution), Circular Convolution as Linear Convolution with aliasing.

Fast Fourier Transform: Direct Computation of the DFT, Symmetry and Periodicity Properties of the Twiddle factor (*WN*), Radix-2 FFT Algorithms; Decimation-In-Time (DIT) FFT Algorithm; Decimation-In-Frequency (DIF) FFT Algorithm, Inverse DFT Using FFT Algorithms. (15 Lectures)

Unit-4

Realization of Digital Filters: Non Recursive and Recursive Structures, Canonic and Non Canonic Structures, Equivalent Structures (Transposed Structure), FIR Filterstructures; Direct-Form; Cascade-Form; Basic structures for IIR systems; Direct-Form I.

Infinite Impulse Response Digital Filter: Design of IIR Filters from Analog Filters, IIR Filter Design by Approximation of Derivatives, Backward Difference Algorithm, Impulse Invariance Method. (15 Lectures)

Reference Books:

- Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India.
- Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
- Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn. Oxford University Press.
- Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.Harris, 2005, Cengage Learning.
- Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
- Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.

DIGITAL SIGNAL PROCESSING LAB

1. Verification of properties of a system : linear and convolution
2. Finding DFT of a given sequence
3. Linear and circular convolution using DFT
4. Solution of simple difference equations
5. Verification of sampling theorem
6. Determination of impulse response of a given system
7. Determination of response of system to any arbitrary input
8. Design of simple IIR filters – Butterworth

9. Finding DFT using FFT. 1. Write a program to generate and plot the following sequences:

(a) Unit sample sequence $\delta(n)$,
(b) Unit step sequence u(n),
(c) Ramp sequence r(n) ,
(d) Real valued exponential sequence

$$x(n) = (0.8)^{n} u(n) \text{ for } 0 \leq n \leq 50.$$

10. Write a program to compute the convolution sum of a rectangle signal (or gate function) with itself for N = 5

$$(n) = \left(\frac{n}{2N}\right) = \Pi\left(\frac{n}{2N}\right) = \begin{cases} 1 & -N \leq n \leq N \\ 0 & otherwise \end{cases}$$

(Note: Minimum of 08 experiments to be done).

CME26404

SEMESTER V

DSE1B: ELECTRONIC INSTRUMENTATION

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course a student is able to

CO1: Specify in detail, basic electronic measurement instruments.

CO2: Write down the classification and working of impedance measuring instruments.

CO3: Specify the details of power supply.

CO4: Understand the working and applications of transducers

Unit 1:

Measurements: Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference.

Basic Measurement Instruments: DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter; Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement.

Measurement of Impedance- A.C. bridges, Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge).

(15 Lectures)

Unit 2:

Power supply: Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), Line and load regulation, Short circuit protection. Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS).

Oscilloscope: Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments.

(15 Lectures)

Unit 3:

Lock-in-amplifier: Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals.

Signal Generators: Function generator, Pulse Generator, (Qualitative only).

Virtual Instrumentation: Introduction, Interfacing techniques (RS 232, GPIB, USB), Idea about Audrino microcontroller and interfacing software like lab View).

(15 Lectures)

Unit 4:

Transducers:

Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications), Capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells). (15 Lectures)

Reference Books:

• W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).

• E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition (2003).

• David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).

• Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).

• S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).

• Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning.

ELECTRONIC INSTRUMENTATION LAB

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.
2. Measurement of Capacitance by De Sauty's bridge.
3. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge).
4. To determine the Characteristics of LVDT.
5. To determine the Characteristics of Thermistors and RTD.
6. Measurement of temperature by Thermocouples.
7. Design a regulated power supply of given rating (5 V or 9V).
8. To design and study the Sample and Hold Circuit.
9. To plot the frequency response of a microphone.

(Note: Minimum of 08 experiments to be done).

CMF26004

SEMESTER VI

DSE1A: VERILOG & VHDL

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of Digital logic design flow.

CO2: Learn the characteristics and model the digital circuits using VHDL behavioural modelling

CO3: Deliberate in detail the dataflow and structural modelling in VHDL

CO4: Describe digital circuits utilizing various constructs of Verilog

Unit-1

Digital logic design flow

Review of combinational circuits. Combinational building blocks: multiplexers, demultiplexer, decoders, encoders and adder circuits. Review of sequential circuit elements: flip-flop, latch and register. Finite state machines: Mealy and Moore. Other sequential circuits: shift registers and counter (15 lectures)

Unit-2

VHDL: Basic Language elements

Identifiers, Data Objects, Data types, Operators

Behavioral Modelling

Entity Declaration, Architecture Body, Process statement, Variable assignment statement, Signal Assignment, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, More on Signal Assignment statement, other sequential statements. (15 Lectures)

Unit-3

Dataflow Modelling

Concurrent Signal Assignment, Concurrent versus Sequential Signal Assignment, Delta Delay Revisited, Multiple Drivers, Conditional Signal Assignment Statement, Selected Signal Assignment Statement, The UNAFFECTED value, Block Statement, Concurrent Assertion Statement, Value of signal.

Structural Modeling

An example, Component Declaration, Component Instantiation, Other examples Resolving Signal Values (15 lectures)

Unit-4

Verilog HDL:

Introduction to HDL. Verilog primitive operators and structural Verilog Behavioral Verilog. Design verification. Modeling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog. (15 lectures)

Reference Books:

1. LizyKurien and Charles Roth. *Principles of Digital Systems Design and VHDL.*Cengage Publishing. ISBN-13: 978-8131505748.
2. Palnitkar, Samir, *Verilog HDL.* Pearson Education; Second edition (2003).
3. Ming-Bo Lin. *Digital System Designs and Practices: Using Verilog HDL andFPGAs.* Wiley India Pvt Ltd. ISBN-13: 978-8126536948.
4. ZainalabedinNavabi. *Verilog Digital System Design.* TMH; 2ndedition. ISBN-13:978-0070252219.
5. Wayne Wolf. *FPGA Based System Design.* Pearson Education.S. K. Mitra, Digital Signal processing, McGraw Hill, 1998.
6. VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.
7. D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems wit.

VERILOG AND VHDL LAB

Experiments using Verilog

1. Write code to realize basic and derived logic gates.
2. Half adder, Full Adder using basic and derived gates.
3. Half subtractor and Full Subtractor using basic and derived gates.
4. Design and simulation of a 4 bit Adder.
5. Multiplexer (4x1) and Demultiplexer using logic gates.
6. Decoder and Encoder using logic gates.
7. Clocked D, JK and T Flip flops (with Reset inputs).
8. 3-bit Ripple counter

Experiments using VHDL

1. Behavioral modeling and simulation of basic gates
2. Structural modeling and simulation of simple Boolean expression
3. Modeling and simulation of adders and subtractors
4. Modeling and simulation of magnitude comparators
5. Modeling and simulation of Flip-flops
6. Modeling and simulation of Shift registers
7. Modeling and simulation of Counters
8. Modeling and simulation of encoders and decoders
9. Modeling and simulation of multiplexers

Note: At least 04 experiments - each from section A and B to be done.

CMF26204

SEMESTER VI

DSE1B: PHOTONIC DEVICES AND POWER ELECTRONICS

Credits: Theory – 04, Practical – 02 Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate the Principles and operations of Photonic devices.

CO2: Deliberate the Principle of operation and characteristics of optical fibers

CO3: Understand the mode of signal prorogation in optical fibres

CO4: Deliberate the characteristics and application of power devices

UNIT 1:

Photonic Devices

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, heterostructureand quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode. Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors,quantum efficiency and responsivity. Photomultiplier tube.

(15 Lectures)

UNIT 2:

Solar Cell

Construction, working and characteristics LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays,applications, advantages over LED displays.

Introduction to Fiber Optics:

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure. (15 Lectures)

UNIT 3:

POWER ELECTRONICS

Power Devices: Need for semiconductor power devices, Power MOSFET (Qualitative).Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-Vcharacteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits.Diac and Triac- Basic structure, working and V-I characteristics. Application of Diacasa triggering device for Triac. (15 Lectures)

UNIT 4:

Insulated Gate Bipolar Transistors (IGBT): Basic structure, I-V Characteristics,switching characteristics, device limitations and safe operating area (SOA).

Applications of SCR: Phase controlled rectification, AC voltage control using SCR and Triac as a switch. Power Invertors- Need for commutating circuits and their varioustypes, dc link invertors, Parallel capacitor commutated invertors, Series Invertor,limitations and its improved versions, bridge invertors.

(15 Lectures)

Reference Books:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009).
3. AK Ghatak& K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
4. Power Electronics, P.C. Sen, Tata McGraw Hill.
5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid,Pearson Education.
7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.

PHOTONIC DEVICES AND POWER ELECTRONICS LAB

1. To determine wavelength of sodium light using Michelson's Interferometer.
2. Diffraction experiments using a laser.
3. Study of Electro-optic Effect.
4. To determine characteristics of (a) LEDs, (b) Photo voltaic cell and (c) Photo diode.
5. To study the Characteristics of LDR and Photodiode with (i) Variable Illumination intensity, and (ii) Linear Displacement of source.
6. To measure the numerical aperture of an optical fiber.
7. Output and transfer characteristics of a power MOSFET.
8. Study of I-V characteristics of SCR.
9. SCR as a half wave and full wave rectifiers with R and RL loads.
10. AC voltage controller using TRIAC with UJT triggering.
11. Study of I-V characteristics of DIAC
12. Study of I-V characteristics of TRIAC.

CME26204

Skill Enhancement Course (SEC)

SEC1A: ELECTRICAL CIRCUITS AND NETWORK SKILLS

(Credits: 02) Theory: 30 Lectures

Course Outcome:

After completion of the course the student acquires skill to

CO1: Design and trouble shoot the electrical circuits and networks

CO2: Carry-out simple domestic wiring.

UNIT 1:

Basic Electricity Principles:

Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC and DC Electricity. Familiarization with multimeter, voltmeter and ammeter.

Electrical Circuits:

Basic electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

Electrical Drawing and Symbols:

Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop. (15 Lectures)

UNIT 2:

Generators and Transformers:

DC Power sources. AC/DC generators. Inductance, capacitance, and impedance. Operation of transformers.

Electric Motors:

Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor

Solid-State Devices:

Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Response of inductors and capacitors with DC or AC sources

Electrical Protection:

Relays. Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge protection. Relay protection device.

Electrical Wiring:

Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, and solder. Preparation of extension board. (15 Lectures)

Reference Books:

1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja.
4. Performance and design of AC machines - M G Say ELBS Edn.

CME26604

Skill Enhancement Course (SEC)

SEC1B: COMPUTER NETWORK

Credits: 02 Theory: 30 Lectures

COURSE OUTCOME:

After completion of the course the student acquires skill to

CO1: Understand the concepts of network devices

CO2: Understand the terminology and concepts of the OSI model

Unit 1:

Data communication, Components & Basic Concepts

Line configuration- point-to-point, multipoint, Topology – Mesh, Star, Tree, Bus, Ring, and Hybrid Topologies Transmission modes – Simplex, Half Duplex, Full Duplex. Categories of networks – LAN, MAN, WAN, Internet

Transmission Media

Guided media – Twisted pair cable, Co-axial cable, Optical fiber

Multiplexing:

Many to one/one to many, types of multiplexing, Frequency division multiplexing, time division multiplexing, multiplexing applications

Error detection

Types of error, multiple bit error, Burst error,Detection – redundancy, Checksu Error correction – Single bit error correction, Hamming code (15 Lectures)

Unit 2

The OSI Model

Model – layered Architecture, Functions of layers- physical layer, Data link layer, Network layer, Transport layer, Session layer, Presentation Layer, Application layer

Networking and internetworking devices

Repeaters, Bridges- types of Bridges, Routers- Routing concepts, Gate ways

World Wide Web:

Uniform Resource Locator (URL), Browser Architect (15 Lectures)

Text Book:

Introduction to Data Communications & Networking by- BEHROUZ FOROUZAN

Reference Book:

Computer Networks by – ANDREW S TANENBAUM

Pattern of theory Question Paper for DSC/DSE

From the academic year 2017-2018 onwards

Time: 3 hours **Max. Marks: 70**

Credits: 4

Part –A

I. Answer all questions. **1 x 10 = 10**

- Ten questions to be set from the four units of the syllabus.
- Minimum of two questions to be set from each unit.
- The question can be simple problems also.

Part - B

II. Answer any Four questions. **4 x 5 = 20**

- **Six** questions to be set from four units of the syllabus.
- Minimum of one question to be set from each unit,
- This section can have questions **or** problems.

Part - C

III. Answer all the questions **4 x 10 = 40**

- Total of four questions to be set.
- One question to be set from each unit for TEN marks with internal choice.
- The questions can have subdivisions.

Pattern of theory Question Paper for SEC

From the academic year 2017-2018 onwards

Time: 2 hours **Max. Marks: 50**

Credits: 2

Part –A

I. Answer any TEN questions **2 x 10 = 20m**

- Total of TWELVE questions to be set.
- SIX questions to be set from each unit.

Part –B

II. Answer any THREE questions selecting at least one question from each unit **3 x 10 = 30m**

- FIVE questions to be set.
- Minimum of two questions to be set from each unit.
- Questions can have subdivisions.