VIDYASAGAR UNIVERSITY

Curriculum for 3-Year B Sc (General)
In

Electronics

Under Choice Based Credit System (CBCS)
w.e.f 2018-2019

VIDYASAGAR UNIVERSITY

B Sc (General) in Electronics

[Choice Based Credit System]

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
1	I	SEMESTER-I					CA	ESE	TOTAL
		Core-1 (DSC-1A)		Network Analysis and Analog Electronics - **Lab**	6	4-0-4	15	60	75
		Core-2 (DSC-2A)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		Core-3 (DSC-3A)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		AECC-1 (Elective)		English/MIL	2	1-1-0	10	40	50
		Semester - I : Total			**20**				**275**
	II	SEMESTER-II							
		Core-4 (DSC-1B)		Linear and Digital integrated Circuits - **Lab**	6	4-0-4	15	60	75
		Core-5 (DSC-2B)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		Core-6 (DSC-3B)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		AECC-2 (Elective)		Environmental Studies	4		20	80	100
				Semester - 2 : Total	**22**				**325**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
2	III	SEMESTER-III					CA	ESE	TOTAL
		Core-7 (DSC-1C)		Communication Electronics - **lab**	6	4-0-4	15	60	75
		Core-8 (DSC-2C)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		Core-9 (DSC-3C)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		SEC-1		TBD	2	1-1-0 /1-0-2	10	40	50
		Semester - 3 : Total			**20**				**275**
	IV	SEMESTER-IV							
		Core-10 (DSC-1D)		Microprocessor and Microcontroller - **Lab**	6	4-0-4	15	60	75
		Core-11 (DSC-2D)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		Core-12 (DSC-3D)		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		SEC-2		TBD	2	1-1-0 /1-0-2	10	40	50
		Semester - 4 : Total			**20**				**275**

Year	Semester	Course Type	Course Code	Course Title	Credit	L-T-P	Marks		
3	V	SEMESTER-V					CA	ESE	TOTAL
		DSE-1A		Discipline-1(Electronics)	6	4-0-4/ 5-1-0	15	60	75
		DSE-2A		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		DSE-3A		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		SEC-3		TBD	2	1-1-0 /1-0-2	10	40	50
		Semester - 5 : Total			**20**				**275**
	VI	SEMESTER-VI							
		DSE-1B		Discipline-1(Electronics)	6	4-0-4/ 5-1-0	15	60	75
		DSE-2B		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		DSE-3B		Other Discipline/TBD	6	4-0-4/ 5-1-0	15	60	75
		SEC-4		TBD	2	1-1-0 /1-0-2	10	40	50
		Semester - 6 : Total			**20**				**275**
	Total in all semester:				**122**				**1700**

CC = Core Course , **AECC** = Ability Enhancement Compulsory Course , **GE** = Generic Elective , **SEC** = Skill Enhancement Course , **DSE** = Discipline Specific Elective , **CA**= Continuous Assessment , **ESE**= End Semester Examination , **TBD**=To be decided , **CT** = Core Theory, **CP**=Core Practical , **L** = Lecture, **T** = Tutorial ,**P** = Practical , **MI**L = Modern Indian Language , **ENV**S = Environmental Studies

List of Core and Electives

Core Courses (CC)

DSC-1A: Network Analysis and Analog Electronics
DSC-1B: Linear and Digital Integrated Circuits
DSC-1C: Communication Electronics
DSC-1D: Microprocessor and microcontrollers

Discipline Specific Elective (DSE)

DSE 1: Verilog and FPGA based system Design
Or
DSE 1: Biomedical Instrumentation
Or
DSE 1: Antenna Theory and wireless Network
Or
DSE-1: Semiconductor Devices Fabrication
Or
DSE 1: Digital Signal Processing

DSE 2: Mathematics foundation for electronics
Or
DSE 2: C Programming and Data Structure
Or
DSE 2: Computer Network
Or
DSE 2: Nano - electronics – Science and Growth Technologies
Or
DSE-2: Electronic Instrumentation
Or
DSE 2: Photonic devices and Power Electronics

Skill Enhancement Course (SEC)

SEC-1: Internet and Java Programming
Or
SEC-1: Programming with Matlab / SciLab

SEC-2: Networking and Mobile Communications
Or
SEC-2: Robotics

SEC-3: Design and Fabrication of Printed Circuit Boards
Or
SEC-3: Mobile Application Programming

SEC-4: Applied Optics
Or
SEC-4: Technical Drawing
Or
SEC-4: Circuit modeling using PSPICE

Core Courses (CC)

DSC-1A (CC-1): Network Analysis and Analog Electronics **Credits 06**

DSC1AT: Network Analysis and Analog Electronics **Credits 04**

Course Contents:

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 Conversion. Principal of Duality. Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem. Two Port Networks: h, y and z parameters and their conversion.

Junction Diode and its applications: PN junction diode (Ideal and practical)- constructions, Formation of Depletion Layer, Diode Equation and I-V characteristics. Idea of 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, ripple factor and efficiency. Filter- Shunt capacitor filter, its role in power supply, output waveform, and working. Regulation- Line and load regulation, Zener diode as voltage regulator, and explanation for load and line regulation.

Bipolar Junction Transistor: Review of the 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.

Amplifiers: Transistor biasing and Stabilization circuits- Fixed Bias and Voltage Divider Bias. Thermal runaway, stability and stability factor S. 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. Class A, B and C
Amplifiers.

Cascaded Amplifiers: Two stage RC Coupled Amplifier and its Frequency Response.

Feedback in Amplifiers: Concept of feedback, negative and positive feedback, advantages of negative feedback (Qualitative only).

Sinusoidal Oscillators: Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator. Determination of Frequency and Condition of oscillation.

Unipolar Devices: JFET. Construction, working and I-V characteristics (output and transfer), Pinchoff voltage. UJT, basic construction, working, equivalent circuit and I-V characteristics.

Suggested Readings:

1. Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill
2. Electrical Circuits, M. Nahvi & J. Edminister, Schaum's Outline Series, Tata McGraw-Hill
3. Electrical Circuits, K.A. Smith and R.E. Alley, Cambridge University Press
4. Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.
5. Electronic Devices and Circuits, David A. Bell, 5th Edition, Oxford University Press.
6. Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill
7. Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning
8. Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, , 6th Edn., Oxford University Press.
9. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill
10. J. J. Cathey, Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill

DSC1AP: Network Analysis and Analog Electronics (LAB) Credits 02

Practical:

At least 06 experiments from the following

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 (a) 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).
8. Study the effect of (a) C- filter and (b) Zener regulator on the output of FWR.
9. Study of the I-V Characteristics of UJT and design relaxation oscillator..
10. Study of the output and transfer I-V characteristics of common source JFET.
11. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.
12. Design of a Single Stage CE amplifier of given gain.
13. Study of the RC Phase Shift Oscillator.
14. Study the Colpitt`s oscillator.

Suggested Readings:

1. Electrical Circuits, M. Nahvi and J. Edminister, Schaum's Outline Series, Tata McGraw-Hill
2. Networks, Lines and Fields, J.D.Ryder, Prentice Hall of India.
3. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill
4. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation.

DSC-1B (CC-2) Linear and Digital Integrated Circuits **Credits 06**

DSC1BT: Linear and Digital Integrated Circuits **Credits 04**

Course Contents:

Operational Amplifiers (Black box approach): Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configuration, Frequency Response. CMRR. Slew Rate and concept of Virtual Ground.

Applications of Op-Amps: (1) Inverting and non-inverting amplifiers, (2) Summing and Difference Amplifier, (3) Differentiator, (4) Integrator, (5) Wein bridge oscillator, (6) Comparator and Zero-crossing detector, and (7) Active low pass and high pass Butterworth filter (1st order only).

Number System and Codes: Decimal, Binary, Octal and Hexadecimal number systems, base conversions. Representation of signed and unsigned numbers, BCD code. Binary, octal and hexadecimal arithmetic; addition, subtraction by 2's complement method, multiplication.

Logic Gates and Boolean algebra: Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR, Universal Gates, Basic postulates and fundamental theorems of Boolean algebra.

Combinational Logic Analysis and Design: Standard representation of logic functions (SOP and POS), Minimization Techniques (Karnaugh map minimization up to 4 variables for SOP).

Arithmetic Circuits: Binary Addition. Half and Full Adder. Half and Full Subtractor, 4- bit binary Adder/Subtractor.

Data processing circuits: Multiplexers, De-multiplexers, Decoders, Encoders.

Clock and Timer (IC 555): Introduction, Block diagram of IC 555, Astable and Monostable multivibrator circuits.

Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. Master-slave JK Flip-Flop.

Shift registers: 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): Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter.

D-A and A-D 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).

Suggested Readings:

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

DSC1BP: Linear and Digital Integrated Circuits (Lab) **Credits 02**

Practical:

At least 04 experiments each from section A, B and C

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

1. To design an inverting amplifier using Op-amp (741,351) for dc voltage of given gain
2.
   (a) To design inverting amplifier using Op-amp (741,351) & study its frequency response,
   (b) To design non-inverting amplifier using Op-amp (741,351) & study frequency response
3.
   (a) To add two dc voltages using Op-amp in inverting and non-inverting mode,
   (b) To study the zero-crossing detector and comparator.
4. To design a precision Differential amplifier of given I/O specification using Op-amp.
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 design a Wien bridge oscillator for given frequency using an op-amp.
8. To design a circuit to simulate the solution of simultaneous equation and 1st/2ndorder differential equation.

9. Design a Butterworth Low Pass active Filter (1st order) & study Frequency Response
10. Design a Butterworth High Pass active Filter (1st order) & study Frequency Response
11. Design a digital to analog converter (DAC) of given specifications.

Section-B: Digital circuits (Hardware)

1. (a) To design a combinational logic system for a specified Truth Table.,
   (b) To convert Boolean expression into logic circuit & design it using logic gate ICs.,
   (c) To minimize a given logic circuit.

2. Half Adder and Full Adder.
3. Half Subtractor and Full Subtractor.
4. 4 bit binary adder and adder-subtractor using Full adder IC.
5. To design a seven segment decoder.
6. To design an Astable Multivibrator of given specification using IC 555 Timer.
7. To design a Monostable Multivibrator of given specification using IC 555 Timer.
8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
9. To build JK Master-slave flip-flop using Flip-Flop ICs
10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.
11. 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 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 1storder active low pass and high pass filters of given cutoff frequency
6. Design a Wein`s 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.

Suggested Readings:

1. Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., Tata McGraw
2. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edn., Prentice Hall
3. R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill
4. Digital Electronics, S.K. Mandal, 1st edition, McGraw Hill

DSC-1C (CC-3): Communication Electronics **Credits 06**

DSC1CT: Communication Electronics **Credits 04**

Course Contents:

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, modulation index and frequency spectrum. Generation of AM (Emitter Modulation), Amplitude Demodulation (diode detector), Concept of Single side band generation and detection. 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), Qualitative idea of Super heterodyne receiver

Analog Pulse Modulation: Channel capacity, Sampling theorem, Basic Principles - PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing.

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 and Navigation 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. Uplink and downlink.

Mobile Telephony System – Basic concept of mobile communication, frequency bands used in mobile communication, concept of cell sectoring and cell splitting, SIM number, IMEI number, need for data encryption, architecture (block diagram) of mobile communication network, idea of GSM, CDMA, TDMA and FDMA technologies, simplified block diagram of mobile phone handset, 2G, 3G and 4G concepts (qualitative only).

GPS navigation system (qualitative idea only)

Suggested Readings:

1. Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.
2. Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.

3. Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, Oxford University Press.
4. Electronic Communication systems, G. Kennedy, 3rd Edn., Tata McGraw Hill.
5. Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill
6. Communication Systems, S. Haykin, Wiley India
7. Electronic Communication system, Blake, Cengage, 5th edition.
8. Wireless communications, Andrea Goldsmith, Cambridge University Press

DSC1CP: Communication Electronics (Lab) **Credits 02**

Practical:

1. To design an Amplitude Modulator using Transistor
2. To study envelope detector for demodulation of AM signal
3. To study FM - Generator and Detector circuit
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

Suggested Readings:

1. Electronic Communication systems, G. Kennedy, Tata McGraw Hill.
2. Electronic Communication system, Blake, Cengage, 5th edition.

DSC-1D (CC-4): Microprocessor and Microcontroller **Credits 06**

DSC1DT: Microprocessor and Microcontroller **Credits 04**

Course Contents:

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 including stacks. Arithmetic, logical, branch, and control instructions). Subroutines, delay loops. Timing & Control circuitry. Timing states. Instruction cycle, Timing diagram of MOV and MVI. Hardware and software interrupts.

8051 microcontroller: Introduction and block diagram of 8051 microcontroller, architecture of 8051, overview of 8051 family, 8051 assembly language programming, Program Counter and ROM memory map, Data types and directives, Flag bits and
Program Status Word (PSW) register, Jump, loop and call instructions.

8051 I/O port programming: Introduction of I/O port programming, pin out diagram of 8051 microcontroller, I/O port pins description & their functions, I/O port programming in 8051 (using assembly language), I/O programming: Bit manipulation.

8051 Programming: 8051 addressing modes and accessing memory locations using various addressing modes, assembly language instructions using each addressing mode, arithmetic and logic instructions, 8051 programming in C: for time delay & I/O operations and manipulation, for arithmetic and logic operations, 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.

Suggested Readings:

1. Microprocessor Architecture Programming & applications with 8085, R.S. Goankar, Prentice Hall.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, Tata McGraw Hill
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., Pearson Education India.
4. Microprocessor and Microcontrollers, N. Senthil Kumar, Oxford University Press
5. 8051 microcontrollers, Satish Shah, Oxford University Press.
6. Embedded Systems: Design & applications, S.F. Barrett, Pearson Education India
7. Introduction to embedded system, K.V. Shibu, 1st edition, McGraw Hill
8. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano ,Cengage Learning

DSC1DP: Microprocessor and Microcontroller (Lab) **Credits 02**

Practical

At least 06 experiments each from Section-A and Section-B

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. Use of CALL and RETURN Instruction.
7. Block data handling.
8. Other programs (e.g. Parity Check, using interrupts, etc.).

Section-B: Experiments using 8051 microcontroller

1. To find that the given numbers is prime or not.
2. To find the factorial of a number.
3. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
4. 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.
6. Program to rotate the contents of the accumulator first right and then left.
7. Program to run a countdown from 9-0 in the seven segment LED display.
8. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.
9. To toggle '1234' as '1324' in the seven segment LED display.
10. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clockwise direction.
11. Application of embedded systems: Temperature measurement & display on LCD

Suggested Readings:

1. Microprocessor Architecture Programming & applications with 8085, R.S. Goankar, Prentice Hall.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, Tata McGraw Hill
3. The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A. Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., Pearson Education India.
4. 8051 microcontrollers, Satish Shah, Oxford University Press.
5. Embedded Microcomputer systems: Real time interfacing, J.W. Valvano, Cengage Learning

Discipline Specific Electives (DSE)

DSE-1 : Verilog & FPGA based System Design **Credits 06**

DSE1T : Verilog & FPGA based System Design **Credits 04**

Course Contents:

Digital logic design flow. Review of combinational circuits. Combinational building blocks: multiplexors, demultiplexers, 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 counters. FSMD (Finite State Machine with Datapath): design and analysis. Microprogrammed control. Memory basics and timing. Programmable Logic devices.

Evolution of Programmable logic devices. PAL, PLA and GAL. CPLD and FPGA architectures. Placement and routing. Logic cell structure, Programmable interconnects, Logic blocks and I/O Ports. Clock distribution in FPGA. Timing issues in FPGA design. Boundary scan.

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.

Suggested Readings:

1. Lizy Kurien and Charles Roth. *Principles of Digital Systems Design and VHDL*. Cengage Publishing.
1. Palnitkar, Samir, *Verilog HDL*. Pearson Education; Second edition
2. Ming-Bo Lin. *Digital System Designs and Practices: Using Verilog HDL and FPGAs.* Wiley India Pvt Ltd.
3. Zainalabedin Navabi. *Verilog Digital System Design. 2nd Edn.* TMH; .
4. Wayne Wolf. *FPGA Based System Design.* Pearson Education.
5. S. K. Mitra, Digital Signal processing, McGraw Hill,
6. Debaprasad Das, VLSI design, 2nd Edition, Oxford University Press.
7. D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems with Verilog, Cambridge University Press,

DSE1P : Verilog & FPGA (Lab) **Credits 02**

At least 08 experiments from following.

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.
9. To design and study switching circuits (LED blink shift).
10. To design traffic light controller.
11. To interface a keyboard.

12. To interface a LCD using FPGA.
13. To interface multiplexed seven segment display.
14. To interface a stepper motor and DC motor.
15. To interface ADC 0804.

Suggested Readings:

1. W.Wolf, FPGA- based System Design, Pearson,
2. U. Meyer Baese, Digital Signal Processing with FPGAs, Springer,
3. S. Palnitkar, Verilog HDL– A Guide to Digital Design & Synthesis, Pearson,
4. Verilog HDL primer- J. Bhasker. BSP, II edition

Or

DSE- 1: Biomedical Instrumentation **Credits 06**

DSE1T: Biomedical Instrumentation **Credits 04**

Course Contents:

Biomedical signals & Physiological transducers

Source of biomedical signal, Origin of bioelectric signals, recording electrodes, Electrodes for ECG, EMG & EEG .Physiological transducers: Pressure, Temperature, photoelectric & ultrasound Transducers. Measurement in Respiratory system: Physiology of respiratory system, Measurement of breathing mechanics Spiro meter, Respiratory therapy equipments Inhalators ventilators & Respirators , Humidifiers , Nebulizers Aspirators, Biomedical recorders: ECG, EEG & EMG. MEMS based biosensors

Patient Monitoring systems & Audiometers:

Cardiac monitor, Bedside patient monitor, measurement of heart rate, blood pressure, temperature, respiration rate, Arrhythmia monitor, Methods of monitoring fatal heart rate, Monitoring labor activity. Audiometers: Audiometers, Blood cell counters, Oximeter, Blood flow meter, cardiac output measurement, Blood gas analyzers.

Modern Imaging systems

Introduction, Basic principle & Block diagram of x-ray machine, x- ray Computed Tomography (CT), Magnetic resonance imaging system (NMR), ultrasonic imaging system. Eco-Cardiograph, Eco-Encephalography, Ophthalmic scans, MRI. Therapeutic Equipments: Cardiac pacemakers, cardiac defibrillators, Hemodialysis machine, surgical diathermy machine.

Patients safety & Computer Applications in Biomedical field & Physiotherapy

Patients safety & Computer Applications in Biomedical field: Precaution, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment, Use of microprocessors in medical instruments, Microcontrollers, PC based medical instruments, Computerized Critical care units, Planning & designing a computerized critical care unit.
Physiotherapy: Software Diathermy, microwave diathermy, Ultrasound therapy unit. Electrotherapy Equipments, Ventilators.

Minimum Learning outcome: Students should learn the different available Physiological transducers and imaging systems and their applicability in different cases

DSE1P: Biomedical Instrumentation Lab **Credit: 02**

Practical :

1. Characterization of bio potential amplifier for ECG signals.
2. Study on ECG simulator
3. Measurement of heart sound using electronic stethoscope. Study on ECG heart rate monitor /simulator
4. Study of pulse rate monitor with alarm system
5. Determination pulmonary function using spirometer (using mechanical system).
6. Measurement of respiration rate using thermistor /other electrodes.
7. Study of Respiration Rate monitor/ apnea monitor
8. Study on ultrasound transducers based on medical system
9. Study of a Pacemaker.
10. Measurement of pulse rate using photoelectric transducer & pulse counting for known period.

Suggested Readings:

1. Joseph J. Carr & John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson.
2. Shakti Chatterjee, "Textbook of Biomedical Instrumentation System", Cengage Learning
3. Ananda Natarajan Biomedical Instrumentation and Measurements, 2nd ed. • PHI
4. Bertil Jacobson & John G. Webster - Medicine and Clinical Engineering, PHI

5. Prof. S.K.VenkataRam-Bio-Medical Electronics and Instrumentation, Galgotia Publications
6. John G.Webster- Medical Instrumentation-Application and Design Wiley Student Edition)
7. L.Cromwell et al- Biomedical Instrumentation and Measurements PHI

Or

DSE-1 : Antenna theory and Wireless Networks **Credits 06**

DSE1T : Antenna theory and Wireless Networks

Course Contents:

Antenna Theory:

Introduction: Antenna as an element of wireless communication system, Antenna radiation mechanism, Types of Antennas, Fundamentals of EMFT: Maxwell's equations and their applications to antennas.

Antenna Parameters: Antenna parameters: Radiation pattern (polarization patterns, Field and Phase patterns), Field regions around antenna, Radiation intensity, Beam width, Gain, Directivity, Polarization, Bandwidth, Efficiency and Antenna temperature.

Antenna as a Transmitter/Receiver: Effective Height and Aperture, Power delivered to antenna, Input impedance. Radiation from an infinitesimal small current element, Radiation from an elementary dipole (Hertzian dipole), Reactive, Induction and Radiation fields, Power density and radiation resistance for small current element and half wave dipole antenna.

Radiating wire Structures (Qualitative idea only): Monopole, Dipole, Folded dipole, Loop antenna and Biconical broadband Antenna. Basics of Patch Antenna and its design. Examples of Patch antenna like bowtie, sectoral, fractal, etc.

Propagation of Radio Waves: Different modes of propagation: Ground waves, Space waves, Space Wave propagation over flat and curved earth, Optical and Radio Horizons, Surface Waves and Troposphere waves, Ionosphere, Wave propagation in the Ionosphere. Critical Frequency, Maximum usable frequency (MUF), Skips distance. Virtual height. Radio noise of terrestrial and extraterrestrial origin. Elementary idea of propagation of waves used in Terrestrial mobile communications.

Wireless Networks

Introduction: History of wireless communication, Wireless Generation and Standards, Cellular and Wireless Systems, Current Wireless Systems, Cellular Telephone Systems, Wide Area

Wireless Data Services, Broadband Wireless Access, Satellite Networks, Examples of Wireless Communication Systems. Idea about Global Mobile communication system.

Modern Wireless Communication Systems: Second Generation (2G) Cellular Networks, Third Generation (3G) Wireless Networks, Wireless Local Loop (WLL), Wireless Local Area Networks (WLANs), Bluetooth and Personal Area Networks
(PANs). Idea about Wi-Fi, 4G and LTE, and 5G.

Cellular Concept and System Design Fundamentals: Cellular Concept and Cellular System Fundamentals, Frequency Reuse, Channel Assignment Strategies, Handoff strategies, Interference and System Capacity, Trunking and Grade of Service. Improving
Coverage & Capacity in Cellular Systems. Cell Splitting and Sectoring. Cellular Systems design Considerations (Qualitative idea only).

Suggested Readings:

1. Ballanis, Antenna Theory, John Wiley & Sons, 2nd Ed.
2. Jordan and Balmain, E. C., Electro Magnetic Waves and Radiating Systems, PHI, 1968 Reprint ,3rd Ed.
3. Andrea Goldsmith, Wirelerss communications, Cambridge University Press
4. D. Tse and P. Viswanathan, Fundamentals of Wireless Communication, Cambridge University Press.
5. Wireless communication and Networks, Upena Dala, Oxford University Press.
6. Antenna and Wave Propagation, Yadava, PHI Learning.
7. Haykin S. & Moher M., Modern Wireless Communication, Pearson, 3rd Ed.
8. Lee, William C.Y., Mobile Communciation Design and Fundamentals, 4th Ed

Or

DSE-1: Semiconductor Devices Fabrication **Credits 06**

DSE1T: Semiconductor Devices Fabrication **Credits 04**

Course Contents:

Introduction: Review of energy bands in materials. Metal, Semiconductor and Insulator. Doping in Semiconductors, Defects: Point, Line, Schottky and Frenkel. Single Crystal, Polycrystalline and Amorphous Materials. Czochralski technique for Silicon Single Crystal Growth.

Thin Film Growth Techniques and Processes: Vacuum Pumps: Primary Pump (Mechanical) and Secondary Pumps (Diffusion, Turbo-molecular, Cryopump, Sputter - Ion)– basic working principle, Throughput and Characteristics in reference to Pump Selection. Vacuum Gauges (Pirani and Penning). Sputtering, Evaporation (Thermal, electron-Beam, Pulse Laser Deposition

(PLD), Chemical Vapor Deposition (CVD). Epitaxial Growth, Deposition by Molecular Beam Epitaxy (MBE). Thermal Oxidation Process (Dry and Wet) Passivation. Metallization. Diffusion of Dopants. Diffusion Profiles. Ion implantation.

Semiconductor Devices: Review of p-n Junction diode, Metal-Semiconductor junction, Metal-Oxide-Semiconductor (MOS) capacitor and its C-V characteristics, MOSFET (enhancement and depletion mode) and its high Frequency limit. Microwave Devices: Tunnel diode.

Memory Devices: Volatile Memory: Static and Dynamic Random Access Memory (RAM), Complementary Metal Oxide Semiconductor (CMOS) and NMOS, Non- Volatile - NMOS (MOST, FAMOS), Ferroelectric Memories, Optical Memories, Magnetic Memories, Charge Coupled Devices (CCD).

VLSI Processing: Introduction of Semiconductor Process Technology, Clean Room Classification, Line width, Photolithography: Resolution and Process, Positive and Negative Shadow Masks, Photoresist, Step Coverage, Developer. Electron Beam Lithography. Idea of Nano-Imprint Lithography. Etching: Wet Etching. Dry etching (RIE and DRIE). Basic Fabrication Process of R, C, P-N Junction diode, BJT, JFET, MESFET, MOS, NMOS, PMOS and CMOS technology. Wafer Bonding, Wafer Cutting, Wire bonding and Packaging issues (Qualitative idea).

Micro Electro-Mechanical System (MEMS): Introduction to MEMS, Materials selection for MEMS Devices, Selection of Etchants, Surface and Bulk Micromachining, Sacrificial Subtractive Processes, Additive Processes, Cantilever, Membranes. General Idea MEMS based Pressure, Force, and Capacitance Transducers.

Suggested Readings:

1. Physics of Semiconductor Devices, S. M. Sze. Wiley-Interscience.
2. Handbook of Thin Film Technology, Leon I. Maissel and Reinhard Glang.
3. Fundamentals of Semiconductor Fabrication, S.M. Device and G. S. May, John- Wiley and Sons, Inc.
4. The science and Engineering of Microelectronics Fabrication, Stephen A. Champbell, , Oxford University Press.
5. Introduction to Semiconductor materials and Devices, M. S. Tyagi, John Wiley & Sons
6. VLSI Fabrication Principles (Si and GaAs), S.K. Gandhi, John Wiley & Sons, Inc.

DSE1P: Semiconductor Devices Fabrication (Lab) **Credits 02**

Practical:

At least 05 experiments from the following

1. Fabrication of alloy p-n Junction diode and study its I-V Characteristics.
2. Study the output and transfer characteristics of MOSFET.

3. To design and plot the static & dynamic characteristics of digital CMOS inverter.
4. Create vacuum in a small tube (preferably of different volumes) using a Mechanical rotary pump and measure pressure using vacuum gauges.
5. Deposition of Metal thin films/contacts on ceramic/thin using Thermal Evaporation and study IV characteristics.
6. Selective etching of Different Metallic thin films using suitable etchants of different concentrations.
7. Wet chemical etching of Si for MEMS applications using different concentration of etchant.
8. Calibrate semiconductor type temperature sensor (AD590, LM 35, and LM 75).
9. Quantum efficiency of CCDs.
10. To measure the resistivity of a semiconductor (Ge) crystal with temperature (up to 150˚C) by four-probe method.
11. To fabricate a ceramic and study its capacitance using LCR meter.
12. To fabricate a thin film capacitor using dielectric thin films and metal contacts and study its capacitance using LCR meter.
13. Study the linearity characteristics of (a) Pressure using capacitive transducer (b) Distance using ultrasonic transducer

Suggested Readings:

1. Physics of Semiconductor Devices, S. M. Sze. Wiley-Interscience.
2. Handbook of Thin Film Technology, Leon I. Maissel and Reinhard Glang.
3. The science and Engineering of Microelectronics Fabrication, Stephen A. Champbell, Oxford University Press.
4. VLSI Fabrication Principles (Si and GaAs), S.K. Gandhi, John Wiley & Sons, Inc.

Or

DSE-1: Digital Signal Processing **Credits 06**

DSE1T: Digital Signal Processing **Credits 04**

Course Contents:

Discrete Time systems:

Discrete sequences, linear coefficient difference equation, Representation of DTS, LSI Systems. Stability and causality, frequency domain representations and Fourier transform of DTsequences.

Network Synthesis:

Concept of pole-zero, properties of pole-zeroes Synthesis of two terminal reactive networks, Foster's Reactance Theorem, Network realization of reactance function, Canonic Networks,

Continued fraction Networks (Cauer Networks), numerical. Synthesis of Two terminal R-C & R-L networks, Positive Real Functions, numerical.

Discrete Fourier Transform:

DFT assumptions and Inverse DFT. Matrix relations, relationship with FT and its inverse, circular convolution, DFT theorems, DCT. Computation of DFT. FFT Algorithms and processing gain, Discrimination, interpolation and extrapolation. Gibbs phenomena. FFT of real functions interleaving and resolution improvement. Word length effects.

Digital Filters:

Analog filter review-Concept of Filters in signal processing, filter parameters ,Concept of LP, HP, BP, Notch Filter ,types of filters – Butterworth, Chebyshev. System function for IIR and FIR filters, network representation. Canonical and decomposition networks. IIR filter realization methods and their limitations. FIR filter realization techniques. Discrete correlation and convolution; Properties and limitations

Minimum Learning outcome:
Students should be able to understand the behavior of a system from its transfer function, concept of pole- zero and stability. Frequency analysis of a system in the discrete domain.

DSE-1P: Digital Signal Processing (Lab) Credit 02

Practical

1. Generation of unit sample sequence, unit step, ramp function, discrete time sequence, real sinusoidal sequence.
2. Generate and plot sequences over an interval.
3. Given x[n], write program to find X[z].
4. Fourier Transform, Discrete Fourier Transform and Fast Fourier Transform
5. Design of a Butterworth analog filter for low pass and high pass.
6. Design of digital filters.

Suggested Readings:

1. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall.
2. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall.
3. Anand Kumar , Digital Signal Processing, 2nd ed.PHI

4. Udayashankara, Modern Digital Signal Processing includes Signals and Systems, MATLAB Programs, DSP Architecture with Assembly and C Programs, 3rd Edn PHI
5. Ramesh Babu, Digital Signal Processing - 6th Edn., Scitech

DSE-2: Mathematics Foundation for Electronics **Credits 06**

DSE2T: Mathematics Foundation for Electronics **Credits 04**

Course Contents:

Ordinary Differential Equation &Series solution of differential equations and special functions:

First Order Ordinary Differential Equations, Basic Concepts and different types of Differential Equations. Second Order homogeneous and non-homogeneous Differential Equations. Different solution techniques as applied to physical problems- like thermal, hydraulic, electrical systems. Solution by Power series method. Error functions and gamma function.

Matrices:

Introduction to Matrices, Different techniques for solution of a System of Linear Algebraic Equations. Eigen Values and Eigen Vectors, Linear Transformation, Properties of Eigen Values and Eigen Vectors, Cayley-Hamilton Theorem, Classification of different types of Real and Complex Matrices.

Sequences and series:

Sequences, Limit of a sequence, Convergence, Divergence and Oscillation of a sequence, Infinite series- conditions and methods.

Complex Variables and Functions:

Complex Variable, Complex Function, Continuity, Differentiability, Analyticity. Different types of functions. Line Integral in Complex Plane, Sequences, Series and Power Series, Taylor's Series, Laurent Series, Zeroes and Poles. Residue integration method.

Laplace:

Laplace Transform-Properties , Transform of different signals ,inverse transform, application in Circuit Analysis - Equivalent circuit of inductor, capacitor in s-domain

DSE2P: Mathematical Foundation for electronics (labs) **Credit: 02**

1. Solution of First Order Differential Equations.
2. Solution of Second Order homogeneous Differential Equations.
3. Solution of Second Order non-homogeneous Differential Equations.
4. Convergence of a given series.
5. Divergence of a given series.
6. Solution of linear system of equations using Gauss Elimination method.
7. Solution of linear system of equations using Gauss – Seidel method.

Suggested Readings:

1. E. Kreyszig, advanced engineering mathematics, Wiley India (2008)
2. Murray Spiegel, Seymour Lipschutz, John Schiller, Outline of Complex Variables,
3. Schaum Outline Series, Tata McGraw Hill (2007)
4. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Limited (2007)
5. Pal & Bhunia, Engineering Mathematics, Oxford
6. Garg / Gupta, Engineering Mathematics Volume I & II Pearson
7. Dass H.K./Verma Rama Higher Engineering Mathematics S Chand
8. John Bird Engineering Mathematics

Or

DSE-2: C Programming and Data Structures **Credits 06**

DSE2T: C Programming and Data Structures **Credits 04**

Course Contents:

C Programming Language:

Introduction, Importance of C, Character set, Tokens, keywords, identifier, constants, basic data types, variables: declaration & assigning values. Structure of C program**.** Arithmetic operators, relational operators, logical operators, assignment operators, increment and decrement operators, conditional operators, bit wise operators, expressions and evaluation of expressions, type cast operator, implicit conversions, precedence of operators. Arrays-concepts, declaration, accessing

elements, storing elements, two-dimensional and multi-dimensional arrays. Input output statement and library functions (math and string related functions)

Decision Making, branching & looping, Structures & Introduction to C++:

Decision making, branching & looping: Decision making, branching and looping: if, if-else, else-if, switch statement, break, for loop, while loop and do loop. Functions: Defining functions, function arguments and passing, returning values from functions. Structures: defining and declaring a structure variables, accessing structure members, initializing a structure, copying and comparing structure variables, array of structures, arrays within structures, structures within structures, structures and functions. Pointers. Introduction to C++: Object oriented programming, characteristics of an object-oriented language

Data Structures:

Definition of stack, array implementation of stack, conversion of infix expression to prefix, postfix expressions, evaluation of postfix expression. Definition of Queue, Circular queues, Array implementation of queues. Linked List and its implementation, Link list implementation of stack and queue, Circular and doubly linked list

Searching and Sorting:

Searching and sorting: Insertion sort, selection sort, bubble sort, merge sort, linear Search, binary search. Trees : Introduction to trees, Binary search tree, Insertion and searching in a BST, preorder, postorder and inorder traversal (recursive)

DSE2P: C Programming and Data Structures (Lab) Credits 02

Practical:

The list of programs given below is indicative only. Students should do programs which make use of the different programming techniques and data structures.

1. Generate the Fibonacci series up to the given limit N and also print the number of elements in the series.
2. Find minimum and maximum of N numbers.
3. Find the GCD of two integer numbers.
4. Calculate factorial of a given number.

5. Find all the roots of a quadratic equation $Ax^2 + Bx + C = 0$ for non – zero coefficients A, B and C. Else report error.
6. Calculate the value of sin (x) and cos (x) using the series. Also print sin (x) and cos (x) value using library function.
7. Generate and print prime numbers up to an integer N.
8. Sort given N numbers in ascending order.
9. Find the sum & difference of two matrices of order M×N and P×Q.
10. Find the product of two matrices of order M×N and P×Q.
11. Find the transpose of given M×N matrix.
12. Find the sum of principle and secondary diagonal elements of the given M×N matrix.
13. Calculate the subject wise and student wise totals and store them as a part of the structure.
14. Maintain an account of a customer using classes.
15. Implement linear and circular linked lists using single and double pointers.
16. Create a stack and perform Pop, Push, Traverse operations on the stack using Linear Linked list.
17. Create circular linked list having information about a college and perform Insertion at front, Deletion at end.
18. Create a Linear Queue using Linked List and implement different operations such as Insert, Delete, and Display the queue elements.
19. Implement polynomial addition and subtraction using linked lists.
20. Implement sparse matrices using arrays and linked lists.
21. Create a Binary Tree to perform Tree traversals (Preorder, Postorder, Inorder) using the concept of recursion.
22. Implement binary search tree using linked lists. Compare its time complexity over that of linear search.
23. Implement Insertion sort, Merge sort, Bubble sort, Selection sort.

Suggested Readings:

1. Yashavant Kanetkar, Let us C, BPB Publications
2. Programming in ANSI C, Balagurusamy, 2nd edition, TMH.
3. Byron S Gottfried, Programming with C, Schaum Series
4. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, Prentice Hall

5. Yashavant Kanetkar, Pointers in C, BPB Publications
6. Tanenbaum: “Data Structures using C”, Pearson/PHI.
7. Ellis Horowitz and Sartaz Sahani “Fundamentals of Computer Algorithms”, Computer Science Press.
8. Ghosh All of C PHI
9. Samanta, Classic Data Structures, 2nd ed. • (CD)
10. Thareja, Data Structure Using C, ,2E Oxford
11. Thareja, Introduction to C Programming, 2/E Oxford

Or

DSE-2: Computer Networks **Credits 06**

DSE2T: Computer Networks **Credits 04**

Course Contents:

Data Communication and Switching:

Data Communications: Components, protocols and standards, Network and Protocol Architecture, Reference Model ISO-OSI, TCP/IP-Overview ,topology, transmission mode, digital signals, digital to digital encoding, digital data transmission, DTE-DCE interface, interface standards, modems, cable modem, transmission media- guided and unguided, transmission impairment, Performance, wavelength and Shannon capacity.
Switching: Circuit switching (space-division, time division and space-time division), packet switching (virtual circuit and Datagram approach), message switching

Data Link Layer and Medium Access Sub layer

Data Link Layer: Design issues, Data Link Control and Protocols: Flow and Error Control, Stop-and-wait ARQ. Sliding window protocol, Go-Back-N ARQ, Selective Repeat ARQ, HDLC, Point-to –Point Access: PPP Point –to- Point Protocol, PPP Stack, Error Detection and Correction codes (Parity, Checksum, CRC and Hamming)

Medium Access Sub layer: Channel allocation problem, Controlled Access, Channelization, multiple access protocols, IEEE standard 802.3 & 802.11 for Ethernet LAN and WLAN, introduction to high-speed LANs (Gigabit Ethernet, Jumbo Frames), Token ring, Token Bus, FDDI based LAN, Network Devices-repeaters, hubs, switches bridges.

Network layer:

Design issues, Routing algorithms, Congestion control algorithms,
Host to Host Delivery: Internetworking, addressing and routing, IP addressing (class full & Classless), Subnet, Network Layer Protocols: ARP, IPV4, ICMP, IPV6, ICMPV6.

Transport Layer and Application Layer:

Transport Layer: Process to Process Delivery: UDP; TCP
Application Layer: Client Server Model, Socket Interface, Domain Name System (DNS): Electronic Mail (SMTP), file transfer (FTP), HTTP and WWW. Introductory Concepts of Security: Authentication and Encryption

DSE2P: Computer Networks (Lab) Credits 02

Practical:

1. Setting up off LAN

   (i) Identification of networking components:

   (a) Newtork Cables (CAT 5,6).
   (b) Network Jack and Crimping Process.
   (c) Understading the NIC.

   (ii) Setting up of Local LAN (in windows and LINUX) using switch in a client server mode.
   (iii) Creating workgroups in the same LAN
   (iv) Setting up a system as a Gateway (this should have at least two NIC interfaces) and making two LANs with the Gateway machine as the router (this should be done in LINUX).

2. Introduction to Discrete Event Simulation - Discrete Event Simulation Tools – ns2/ns3,Omnet^{++}
3. Using Free Open Source Software tools for network simulation of telnet and ftp between N sources – N sinks (N = 1, 2, 3). Evaluate the effect of increasing data rate on congestion.
4. Using Free Open Source Software tools for network simulation for http, ftp and DBMS access in networks
5. Using Free Open Source Software tools for network simulation to study effect of VLAN on network performance - multiple VLANs and single router.
6. Using Free Open Source Software tools for network simulation to study the performance of wireless networks

Suggested Readings:

1. S. Tannenbum, D. Wetherall, “Computer Networks”, Prentice Hall, Pearson, 5th Edition
2. Behrouz A. Forouzan, “Data Communications and Networking”, Tata McGraw-Hill, 4thEdition
3. Douglas Comer, “Internetworking with TCP/IP”, Pearson

4. Jim Kurose, “Computer Networking: A Top-down Approach Featuring the Internet” Pearson.
5. Gupta Data Communications and Computer Networks, 2nd ed.•
6. Peterson Davie, Computer Networks – A Systems Approach, Harcourt Butler
7. Kundu, Fundamentals of Computer Networks, 2 Ed, PHI

Or

DSE-2: Nano - electronics – Science and Growth Technologies **Credits 06**

DSE2T: Nano - electronics – Science and Growth Technologies **Credits 04**

Course Contents:

Definition

Definition of Nanoscience and Nanotechnology, distinction between micro, meso and nano domain. Applications of Nanotechnology; Moore`s empirical law and limitation in nano domain. Semiconductor device road map.

Introduction to Physics of Solid State at low dimension

Overview of Quantum Mechanics of Free and confined electrons; Size dependence of transport properties; hetero-junction, Superllatice, Quantum and Nano-structures structures (Quantum Wells, Wires and Dots); Size dependent DOS, Coulomb Blockade and Quantum Capacitance. Impact of nanotechnology on the environment health.

Low dimensional structures

Basic idea of graphene and Carbon nanotubes, nano cuboids. Nano-bio interface.

Applications nano structures

HBTs, NW-FET, CNT-FET, Spintronics, SET, Memristirs etc.

Nano-Fabrication Technology

Concept of “top down” and “bottom up“approach. Top down and bottoms-up approach. Lithographic/non-lithographic techniques.

Top-down Approach- Necessity of a clean room. Si processing methods: Crystal growth techniques, epitaxial deposition methods ; Wafer preparation – Cleaning , Etching Techniques ; Oxidation: Thermal Oxidation Process: Kinetics of Growth , Dry and Wet oxidation; Diffusion:

Basic Diffusion Process: Diffusion Equation, Diffusion Profiles, Ion Implantation, different lithographic techniques, lamda rule, scaling rules, Metallization approaches.

Bottom - up approach - I Self-assembly - mono layers, layer-by layer assembly, control of position and diameter. Sputtering and film deposition , Thermal evaporation technique, E-beam evaporation, Chemical Vapour deposition (CVD), Synthesis of carbon nano-fibres and multi-walled carbon nanotubes, Pulsed Laser Deposition, Molecular beam Epitaxy, Sol-Gel Technique (No chemistry required), Chemical bath deposition, Ion beam deposition system.

Suggested Readings:

1. Hanson,Fundamentals of Nanoelectronics, Pearson
2. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, Nanoscale Science and Technology, John Wiley & Sons, Ltd., UK, 2005.
3. Nanomaterials: synthesis, properties and applications, Institute of Physics.
4. Introduction to Nanotechnology, Charles P. Poole Jr and Frank J. Owens, Wiley Interscience.
5. Chattopadhyay & Banerjee Introduction to Nanoscience and Nanotechnology PHI
6. Bio-Inspired Nanomaterials and Nanotechnology, Edited byYong Zhou, Nova Publishers.
7. Quantum dot heterostructures, Wiley.
8. Modern magnetic materials: principles and applications, John Wiley & Sons.
9. Nano: The Essentials: Understanding Nanoscience andNanotecnology, T.Pradeep, Tata McGraw-Hill Publishing Company Limited, New Delhi.
10. Nanobiotechnology, concepts, applications and perspectives, Wiley-VCH.
11. Ghandhi, VLSI Fabrication Principles Wiley
12. Sze, Semiconductor Devices : Physics & Technology 3e Wiley.
13. Plummer, Silicon VLSI Technology Pearson
14. Weste, CMOS VLSI Design: A Circuits and Systems Perspective, 4e Pearson
15. Campbell, Science & Engineering Of Microelectronic Fabrication 2e Oxford

DSE2P: Nano-electronics-Science and Growth technologies (Lab) Credits 02

Practical:

1. Synthesis of at least two different sizes of Nickel Oxide/ Copper Oxide/ Zinc Oxide nano-particles using Sol-Gel method.
2. Polymer synthesis by suspension method / emulsion method.
3. Selective area electron diffraction: Software based structural analysis based on TEM based experimental data from published literature. (Note: Later experiment may be performed in the lab based on availability of TEM facility).
4. To measure the resistivity of semiconductor crystal with temperature by four – probe method.

5. To determine the type (n- or p-) and mobility of semiconductor material using Hall-effect.
6. Oxidation process Simulation.
7. Diffusion Process Simulation.
8. To design a pattern using photolithographic process and its simulation process integration simulation.

Or

DSE-2: Electronic Instrumentation **Credits 06**

DSE2T: Electronic Instrumentation **Credits 04**

Course Contents:

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).

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.

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).

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).

Suggested Readings:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall.
2. E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition .
3. David A. Bell, Electronic Devices and Circuits, Oxford University Press.
4. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann).
5. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill.
6. Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning

DSE2P: Electronic Instrumentation (Lab) **Credits 02**

Practical

At least 05 experiments from the following

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.

Suggested Readings:

1. W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).
2. David A. Bell, Electronic Instrumentation & Measurements, Prentice Hall (2013)
3. S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).
4. Basic Electronics:A text lab manual, P.B.Zbar, A.P.Malvino, M.A.Miller, 1990, Mc-Graw Hill

Or

DSE-2: Photonic Devices and Power Electronics **Credits 06**

DSE2T: Photonic Devices and Power Electronics **Credits 04**

Course Contents:

UNIT-I: 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, heterostructure and 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.

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.

UNIT-II: Power Electronics

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

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 various types, dc link invertors, Parallel capacitor commutated invertors, Series Invertor, limitations and its improved versions, bridge invertors.

Suggested Readings:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education
3. AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press
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, Oxford University Press.

DSE2P: Photonic Devices and Power Electronics (Lab) **Credits 02**

Practical:

At least 06 experiments from the following

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

Suggested Readings:

1. AK Ghatak & K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press
2. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill
3. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H.Rashid, Pearson Education
4. A Textbook of Electrical Technology-Vol-II, B.L. Thareja, A.K. Thareja, S.Chand.

Skill Enhancement Course (SEC)

SEC-1: Internet and Java Programming **Credits 02**

SEC1T: Internet and Java Programming **Credit 01**

Course Contents:

Internet

Introduction, Understanding the Internet, Internet Addressing, Hardware Requirements to Connect to the Internet.

Data types, Arrays, Operators, Flow control

Branching, Looping. Classes, New Operator, Dot Operator, Method Declaration and Calling, Constructors, Inheritance, Super, Method Overriding Final, Finalize, Static, Package and Import Statement, Interface and Implements

Exception Handling

Exception Types, Uncaught and Calling, Nested Try Statements, Java Thread Model, and Thread, Runnable, Thread Priorities, Synchronization, Deadlock

File Handling

Input Stream, Output Stream, and File Stream. Applets-Tag, Order of Applet Initialization, Repainting, Sizing Graphics- Abstract Window Tool Kit Components

SEC1P: Programming in Java Lab **Credits 01**

Practical:

1. To find the sum of any number of integers entered as command line arguments
2. To find the factorial of a given number
3. To learn use of single dimensional array by defining the array dynamically.
4. To learn use of .lenth in case of a two dimensional array
5. To convert a decimal to binary number
6. To check if a number is prime or not, by taking the number as input from the keyboard

7. To find the sum of any number of integers interactively, i.e., entering every number from the keyboard, whereas the total number of integers is given as a command line argument

8. Write a program that show working of different functions of String and StringBufferclasss like set Charat set Length (), append (), insert (), concat () and equals ().

9. Write a program to create a class with methods where distance is computed in terms of feet and inches, how to create objects of a class and to see the use of this pointer

10. Modify the class by creating constructor for assigning values (feet and inches) to the distance object. Create another object and assign second object as reference variable to another object reference variable. Further create a third object which is a clone of the first object.

11. Write a program to show that during function overloading, if no matching argument is found, then java will apply automatic type conversions (from lower to higher data type)

12. Write a program to show the use of static functions and to pass variable length arguments in a function.

Suggested Readings:

1. Harley Hahn, The internet complete reference, Tata McGraw publicity,2nd Edition,
2. Patrick Naughton, The Java hand book, Tata McGraw,
3. Rohit Khurana Programming with Java Vikas

Or

SEC-1: Programming with Matlab / SciLab **Credits 02**

SEC1T: Programming with Matlab / SciLab **Credit 01**

Course Contents:

MATLAB Basics

The MATLAB environment - Basic computer programming - Variables and constants, operators and simple calculations - Formulas and functions - MATLAB toolboxes

Matrices and vectors

Matrix and linear algebra review - Vectors and matrices in MATLAB - Matrix operations and functions in MATLAB

Computer programming

Algorithms and structures - MATLAB scripts and functions (m-files) - Simple sequential algorithms - Control structures

MATLAB programming and Numerical Simulations

Matlab Programming. Reading and writing data, file handling - Personalized functions - Toolbox structure - MATLAB graphic functions. Numerical simulations. Numerical methods and simulations - Random number generation – Monte carlo methods.

SEC1P: Practical **Credit 01**

1. Understanding the MATLAB work space

    a. Start up MATLAB.

    b. Type commands in main window.

    c. Change current directory.

2. a. Perform arithmetic calculations.

    b. Understand the operation and functions.

    c. Use MATLAB help file.

    d. Use function like Sin x, Cos x, xCos x to solve problems.

3. Study of basic Matrix operations.

4. Solve linear equations.

Suggested Readings:

1. Hanselman Mastering Matlab, Pearson
2. Rudrapratap Matlab, Oxford
3. Bansal , Matlab, Pearson
4. Navas Lab Primer through Matlab, PHI

SEC -2: Networking and Mobile Communications **Credits 02**

SEC2T: Networking and Mobile Communications

Course Contents:

Networking

Concepts of networking: network layers, network hardware components. Layered protocol architecture-OSI : TCP .Physical media-topology, switching mechanism (circuit and packet switched systems)

Comparison of various transmission media. Transport layer-Connection less and connection oriented protocols. Policies on flow control, error control, MAC-Ethernet, CSMA. CD, ALOHA, FDDI . Network layer-IPV4, ICMP, IGMP, introduction to routing and sub netting

Mobile communication

Evolution from PSTN, Cellular concept, frequency reuse, channel assignment strategies, system capacity, trucking and grade of service

GSM-architecture, protocols, handover, security

Physical layer-Wireless media-characteristics, modes of propagation, various loss mechanisms

Multiplexing and multiple access techniques-FDM, TDM, FDMA,TDMA,CDMA,WCDMA NETWORKING-Mobile IP, dynamic host configuration protocol , wireless LAN technology standards,

Studies on Blue tooth system

To understand concept of Blue tooth technology, to study RF module, RS- 232C serial communication, Blue tooth protocol, different types of Blue tooth network

Wireless Network

Real time Remote Monitoring System of Mobile Base Station using Quad-band GSM/GPRS modem. Understanding of GSM technology, its network, GSM capability & data services. Understanding RF environment & study of GSM network by actually connecting to the GSM environment by any service provider.

Command Level Study

Real Time study of GSM 07.05 & 07.07 commands in various categories : Command concerning modem & sim card hardware, Network registration, Call control, Call setting, Call information, Phone Book, Serial link control, Message setting, Storing/restoring, Error message handling & survey

Suggested Readings:

1. Garg, Mobile Computing, Pearson
2. Garg, Principles and Applications of GSM, Pearson
3. Schiller, Mobile Communications, 2ed., Pearson.

Or

SEC- 2: Robotics **Credits 02**

SEC2T: Robotics

Course Contents:

Programming Environments:

Integrated Development Environment (IDE) for AVR microcontrollers, free IDEs like AVR Studio, WIN AVR. Installing and configuring for Robot programming, In System Programmer (ISP), loading programmes on Robot

Actuators:

DC Motors, Gearing and Efficiency, Servo Motors, Stepper motors, Motor Control and its implementations

Sensors:

White line sensors , IR range sensor of different range, Analog IR proximity sensors , Analog directional light intensity sensors , Position encoders , Servo mounted sensor pod/ Camera Pod, Wireless colour camera , Ultrasound scanner , Gyroscope and Accelerometer , Magnetometer, GPS receiver, Battery voltage sensing, Current Sensing

LCD interfacing and other operations of robotics:

LCD interfacing with the robot (2 x 16 Characters LCD)

Other indicators: Indicator LEDs, Buzzer

Timer / Counter operations: PWM generation, Motor velocity control, Servo control, velocity calculation and motor position Control, event scheduling

Communication: Wired RS232 (serial) Communication, Wireless ZigBee Communication, USB Communication, Simplex infrared Communication (IR remote to robot).

Suggested Readings:

1. Saha, S.K., Introduction to Robotics, 2nd Edition, McGraw-Hill Education, New Delhi, 2014
2. Niku, Introduction to Robotics Wiley
3. GHOSAL, ROBOTICS Oxford
4. Murphy, Introduction to AI Robotics PHI
5. Craig, Introduction to Robotics: Mechanics and Control, 3e Pearson

SEC-3: Design and Fabrication of Printed Circuit Boards **Credits 02**

SEC3T: Design and Fabrication of Printed Circuit Boards

Course Contents:

PCB Fundamentals

PCB Advantages, components of PCB, Electronic components, Microprocessors and Microcontrollers, IC's, Surface Mount Devices (SMD).

Classification of PCB - single, double, multilayer and flexible boards, Manufacturing of PCB, PCB standards.

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, properties of laminates (electrical & physical), types of laminates, soldering techniques. Film master preparation, Image transfer, photo printing, Screen Printing, Plating techniques etching techniques, Mechanical Machining operations, Lead cutting and Soldering Techniques, Testing and quality controls.

PCB Technology:

Trends, Environmental concerns in PCB industry.

Suggested Readings:

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

Or

SEC-3: Mobile Application Programming **Credits 02**

SEC3T: Mobile Application Programming **Credit01**

Course Contents:

Introduction to Mobile Application Programming

Introduction: What is mobile Application Programming, Different Platforms, Architecture and working of Android, iOS and Windows phone 8operating system, Comparison of Android, iOS and Windows phone 8.functions)

Android

Android Development Environment: What is Android, Advantages and Future of Android, Tools and about Android SDK, Installing Java, Eclipse, and Android, Android Software Development Kit for Eclipse, Android Development Tool: Android Tools for Eclipse, AVDs: Smartphone Emulators, Image Editing,

Android Software Development Platform: Understanding Java SE and the Dalvik Virtual Machine, Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML, Screen Sizes, Launching Your Application: The AndroidManifest.xml File, Creating Your First Android Application.

Android Framework Overview: The Foundation of OOP, The APK File, Android Application Components, Android Activities: Defining the User Interface, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications, Content Providers: Data Management, Android Intent Objects: Messaging for Components, Android Manifest XML: Declaring Your Components.

Views and Layouts, Buttons, Menus, and Dialogs, Graphics Resources in Android: Introducing the Drawables, Implementing Images, Core Drawable Subclasses, Using Bitmap, PNG, JPEG and GIF Images in Android, Creating Animation in Android

Handling User Interface (UI) Events: An Overview of UI Events in Android, Listening for and Handling Events , Handling UI Events via the View Class, Event Callback Methods, Handling Click Events, Touch screen Events, Keyboard Events, Context Menus, Controlling the Focus. Content Providers: An Overview of Android Content Providers, Defining a Content Provider, working with a Database. Intents and Intent Filters: Intent, Implicit Intents and Explicit Intents, Intents with Activities, Intents with Broadcast Receivers. Advanced Android: New Features in Android 4.4.

iOS and Windows

iOS Development Environment: Overview of iOS, iOS Layers, Introduction to iOS application development. Windows phone Environment: Overview of windows phone and its platform, Building windows phone application.

SEC-3P: Software Lab Based on Android Programming (Practical)

Credits 01

1. Create ―Hello World‖ application. That will display ―Hello World‖ in the middle of the screen in the emulator. Also display ―Hello World‖ in the middle of the screen in the Android Phone.
2. Create an application with login module. (Check username and password).
3. Create spinner with strings taken from resource folder (res >> value folder) and on changing the spinner value, Image will change.
4. Create a menu with 5 options and and selected option should appear in text box.
5. Create a list of all courses in your college and on selecting a particular course teacher-in-charge of that course should appear at the bottom of the screen.
6. Create an application with three option buttons, on selecting a button colour of the screen will change.
7. Create and Login application as above. On successful login, pop up the message.
8. Create an application to Create, Insert, update, Delete and retrieve operation on the database.

Suggested Readings:

1. Beginning Android 4, Onur Cinar , Apress Publication
2. Professional Android 4 Application Development, Reto Meier, Wrox
3. Beginning iOS 6 Development: Exploring the iOS SDK, David Mark, Apress
4. Pradhan Composing Mobile App. Learn-Explore - Apply using Android Wiley
5. RAJKAMAL, MOBILE COMPUTING, 2/Ed., Oxford
6. Professional Windows 8 Programming: Application Development with C# and XML, Allen Sanders and Kevin Ashley, Wrox Publication

7. Programming with Mobile Applications: Android, iOS, and Windows Phone 7 , Thomas Duffy, Course Technology, Cengage Learning

SEC-4: Applied Optics **Credits 02**

SEC4T: Applied Optics **Credits 01**

Course Contents:

Theory includes only qualitative explanation. Minimum five experiments should be performed covering minimum three sections.

A. Sources and Detectors

Lasers, Spontaneous and stimulated emissions, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

B. Fourier Optics

Concept of Spatial frequency filtering, Fourier transforming property of a thin lens. Concepts of Fraunhofer diffraction, Fresnel diffraction, Plane wave modes, diffraction imaging, Frequency analysis of optical imaging systems, Optical Transfer Functions (OTF), Modulation Transfer Function (MTF), Phase Transfer Functions (PTF), Concepts of spatial frequency filtering, Fourier transforming property of thin lens.

Fourier optic and image processing

1. Optical image addition/subtraction
2. Optical image differentiation
3. Fourier optical filtering
4. Construction of an optical 4f system

Fourier Transform Spectroscopy

Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.

C. Holography

Basic principle and theory: coherence, resolution, Types of holograms, white light reflection hologram, application of holography in microscopy, interferometry, and character recognition

D. Photonics: Fibre Optics

Optical fibres and their properties, Principal of light propagation through a fibre, Thenumerical aperture, Attenuation in optical fibre and attenuation limit, Single mode and multimode fibres, Fibre optic sensors: Fibre Bragg Grating

SEC4P: Experiments (Lab) **Credits 01**

Experiments on Lasers:

a. Determination of the grating radial spacing of the Compact Disc (CD) by reflection using He-Ne or solid state laser.
b. To find the width of the wire or width of the slit using diffraction pattern obtained by a He-Ne or solid state laser.
c. To find the polarization angle of laser light using polarizer and analyzer
d. Thermal expansion of quartz using laser

Experiments on Semiconductor Sources and Detectors:

a. V-I characteristics of LED
b. Study the characteristics of solid state laser
c. Study the characteristics of LDR
d. Photovoltaic Cell
e. Characteristics of IR sensor

Experiments on Fourier Optics:

Fourier optic and image processing

1. Optical image addition/subtraction
2. Optical image differentiation
3. Fourier optical filtering
4. Construction of an optical 4f system

Fourier Transform Spectroscopy

Fourier Transform Spectroscopy (FTS) is a powerful method for measuring emission and absorption spectra, with wide application in atmospheric remote sensing, NMR spectrometry and forensic science.

Experiment: To study the interference pattern from a Michelson interferometer as a function of mirror separation in the interferometer. The resulting interferogram is the Fourier transform of the power spectrum of the source. Analysis of experimental interferograms allows one to determine the transmission characteristics of several interference filters. Computer simulation can also be done.

Experiments on Holography and interferometry:

1. Recording and reconstructing holograms
2. Constructing a Michelson interferometer or a Fabry Perot interferometer
3. Measuring the refractive index of air

4. Constructing a Sagnac interferometer
5. Constructing a Mach-Zehnder interferometer
6. White light Hologram

Experiments on Photonics: Fibre Optics

a. To measure the numerical aperture of an optical fibre
b. To study the variation of the bending loss in a multimode fibre
c. To determine the mode field diameter (MFD) of fundamental mode in a single-mode fibre by measurements of its far field Gaussian pattern
d. To measure the near field intensity profile of a fibre and study its refractive index profile
e. To determine the power loss at a splice between two multimode fibre

Suggested Readings:

1. LASERS: Fundamentals & applications, K.Thyagrajan & A.K.Ghatak, Tata McGraw Hill
2. Fibre optics through experiments, M.R.Shenoy, S.K.Khijwania, et.al. Viva Books
3. Optical Electronics, Ajoy Ghatak and K. Thyagarajan, Cambridge University Press
4. Optics, Karl Dieter Moller, Learning by computing with model examples, Springer.
5. Optoelectronic Devices and Systems, S.C. Gupta, PHI Learning Pvt. Ltd.

Or

SEC-4 : Technical Drawing **Credits 02**

SEC4T : Technical Drawing **Credit 01**

Course Contents:

Introduction: Drafting Instruments and their uses. lettering: construction and uses of various scales: dimensioning as per I.S.I. 696-1972. Engineering Curves: Parabola: hyperbola: ellipse: cycloids, involute: spiral: helix and loci of points of simple moving mechanism.2D geometrical construction. Representation of 3D objects. Principles of projections.

Projections: Straight lines, planes and solids. Development of surfaces of right and oblique solids. Section of solids.

Object Projections: Orthographic projection. Interpenetration and intersection of solids. Isometric and oblique parallel projection of solids.

CAD Drawing: Introduction to CAD and Auto CAD, precision drawing and drawing aids, Geometric shapes, Demonstrating CAD- specific skills (graphical user interface. Create, retrieve, edit, and use symbol libraries. Use inquiry commands to extract drawing data). Control entity properties. Demonstrating basic skills to produce 2-D and 3-D drawings. 3D modeling with Auto

CAD (surfaces and solids), 3D modeling with sketch up, annotating in Auto CAD with text and hatching, layers, templates and design center, advanced plotting (layouts, viewports), office standards, dimensioning, internet and collaboration, Blocks, Drafting symbols, attributes, extracting data. basic printing, editing tools, Plot/Print drawing to appropriate scale.

SEC4P: Practical **Credit 01**

CAD Drawing:
Introduction to CAD and Auto CAD,
Precision drawing and drawing aids, Geometric shapes,
Demonstrating CAD- specific skills (graphical user interface.
Create, retrieve, edit, and use symbol libraries.
Use inquiry commands to extract drawing data). Control entity properties.
Demonstrating basic skills to produce 2-D and 3-D drawings.
3D modeling with Auto CAD (surfaces and solids), 3D modeling with sketch up, annotating in Auto CAD with text and hatching, layers, templates and design center, advanced plotting (layouts, viewports), office standards, dimensioning, internet and collaboration,
Blocks, Drafting symbols, attributes, extracting data. basic printing, editing tools, Plot/Print drawing to appropriate scale.

Suggested Readings:

1. Engineering Drawing, N.S. Parthasarathy and Vele Murali, 1st Edition, Oxford University Press
2. Computer Aided Electrical Drawing, Yogesh et.al. PHI Learning
3. Engineering Graphic, K. Venugopal, and V. Raja Prabhu, New Age International
4. Auto CAD 2014 & Auto CAD 2014/Donnie Gladfelter/Sybex
5. Architectural Design with Sketchup/Alexander Schreyer/John Wiley & Sons.

Or

SEC - 4: Circuit modeling using PSPICE **Credits 02**

SEC4T: Circuit modeling using PSPICE

Credits01

Course Contents:

Introduction

Introduction to PSpice software, file types, netlist commands**.**

Basic Analysis

DC, AC, Transient. Analog behavioral models (ABM): equations setup, IF statement, voltage/current/ frequency dependent sources. Advanced analyses: noise, Monte-Carlo .

Circuit Modeling

• I-V characteristic • Temperature Effects • Iterative solution of simple series circuit • Solution of simple series circuit using an equation solver • PSPICE solution of simple series circuit • PSPICE I-V Characteristic • PSPICE I-V Characteristic with temperature dependence • Thevenin solution • Diode Models • Diode Circuits • Rectifier • Clipping • Zener Circuits • Clipping • MOSFETS • PSPICE AC, DC, transient, and bias point simulations • MOSFET as a switch •Resistive pull-up. • Active pull-up. • Drive an LED. • Basic NMOS gate. • Ohmic and SAT regions • Bias with Current Source • MOSFET Small-Signal Analysis • Small-signal model. • Common-source amplifier. • Source-follower. • Input and output impedance. • Bipolar Junction Transistors • PSPICE AC, DC, transient, and bias point simulations • BJT as a switch • Drive an LED • Drive a relay • Biasing with Current Sources • BJT Small-Signal Analysis • Hybrid-pi model. • Common-emitter amplifier. • Emitter-follower. • Input and output impedance. •OPAMPS – analysis using sub circuits

Suggested Readings:

1. Rashid, Programming with Pspice, Pearson
2. Sedra , Pspice, Oxford

SEC4P: Practical **Credit 01**

1. PSPICE solution of simple circuit.
   a. Low pass, High pass, band bars & band objects filters.
   b. Half wave & full wave rectifier.
2. Frequency response of CE,CC & CS amplifiers.
3. Design of Wein bridge & phase shift oscillators.
4. Verification of Clipper & damper circuits.
5. Design and verification of RC coupled amplifier.